

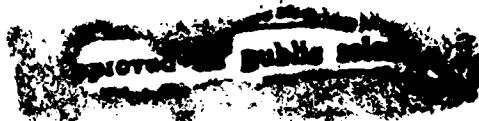
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S • B • I • R

Great Lakes Regional  
Phase III  
Commercialization  
Conference



94-6  
ELECTE  
JUN 08 1994

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Sponsored by  
The National Science Foundation  
and  
The Department of Defense



94-17344

Contractor: Foresight Science & Technology

May 23 - 25, 1994 • Detroit, MI

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## Schedule of Events

### **Sunday, May 22, 1994**

Arrival and networking

### **Monday, May 23, 1994**

8:30 am-1:30 pm	Continue set up of booths and posterboards
1:30 pm-5:30 pm	Large company presentations
5:30 pm-7:00 pm	Reception
7:00 pm-9:00 pm	Seminar on a model CRADA by MERRA, TARDEC (Tank Automotive Research, Development and Engineering Center), Harness, Dickey & Pierce (patent firm), and a TARDEC CRADA small business.

### **Tuesday, May 24, 1994**

7:30 am-8:30 am	Continental Breakfast
8:30 am-12:00 pm	Displays Open
12:00 pm-1:30 pm	Luncheon. Speaker will be the Honorable John Engler, Governor, State of Michigan
1:30 pm-5:30 pm	Displays Open
5:30 pm-7:00 pm	Reception
7:00 pm-9:00 pm	Seminar: Awardee & Large Company Partnership

### **Wednesday, May 25, 1994**

7:30 am-8:30 am	Continental Breakfast
8:30 am-12:00 pm	Displays Open
12:00 pm-1:30 pm	Luncheon and wrap up discussion with Robert Wrenn (DoD) and Roland Tibbetts (NSF)
2:00 pm	Breakdown

## Major Companies

**T**he following list represents Major Companies who will be attending the conference and their areas of technology interest.

Robert Lynch  
**Atlantic Research Corp.**  
5945 Wellington Rd.  
Gainsville, VA 22186  
Tel: (703) 754-5409  
Fax: (703) 754-5638

Solid Propulsion  
DoD Explosives  
Energetic Materials  
Resin Transfer Molding

Gas Generators  
Warheads  
Advanced Composites  
2D and 3D Braiding

Kshitij Mohan, Ph.D.  
James E. Carne  
**Baxter Healthcare Corp.**  
Route 120 & Wilson Rd, (Mohan) WG3-2S  
Round Lake, IL 60073  
Tel: (708) 270-5800  
Fax: (708) 270-5897

Materials Science and Engineering  
Analytical Development  
Pharmaceutical Technologies

Sterilization  
Drug Delivery  
Design Engineering

Allen R. Greene  
**Bell Atlantic**  
1310 North Court House Rd., Suite 700  
Arlington, VA 22201  
Tel: (703) 974-2258  
Fax: (703) 542-6280

Telecommunications - SONET/ATM and broadband applications  
Communications - ISDN, Distance learning, Video-on-demand, Telemedicine

**Paul F. Swenson**  
**Consolidated Natural Gas Service Company**  
625 Liberty Ave., 23rd Floor  
Pittsburgh, PA 15222-3199  
Tel: (412) 227-1321  
Fax: (412) 227-1304 or 1306

Natural gas vehicles or vehicle components;  
Natural gas vehicle fueling stations or components;  
Liquefied natural gas production or utilization methods;  
Gas separation technologies;  
Small (under 1 GPM) hermetic, medium-pressure (20-50 psig Delta P) cryogenic pumps;  
Small-scale (5-500 watt) flame- or heat-activated electric power generation devices;  
Acid- and alkali-impervious coatings;  
Low-cost, encapsulated thermal storage media, acting isothermally at a temperature within the 110-160 F range, preferable selectively;  
Environmentally safe, non-toxic fluids or readily pumpable slurries, with heat capacities substantially greater than water, in the ranges 35-45 degrees F, and 110-160 degrees F (must remain pumpable at -25 degrees F).

**Gilbert B. Chapman, II**  
**Peter T. Rock**  
**Chris E. Borroni-Bird**  
**Chrysler Corp.**  
30900 Stephenson Hwy  
CIMS 463-0000  
Madison Heights, MI 48071  
Tel: (810) 583-5214, Rock 583-5205, Borroni-Bird 583-5270  
Fax: (810) 583-5234

Powertrain technology improvements  
Computer aided engineering  
Vehicle chassis technology improvements  
Vehicle body technology improvements  
Electrical/electronic applications to vehicles

**Donald Valentine, Jr., Director, Technology Acquisition**  
**Cytec Industries Inc.**  
**Cytec Research & Development**  
**1937 West Main Street**  
**Stamford, CT 06904-0060**  
**Tel: (203) 321-2266**  
**Fax: (203) 321-2975**

**Biological processes for chemicals**  
**Water treating - industrial, municipal, mining, paper industry**  
**Soil erosion**  
**Environmentally friendly chemical manufacture**  
**Advanced polymer technology**  
**Trace analytical methods, sensors**  
**Adhesives**  
**Composites**

**Gary Rabold**  
**Dow U.S.A.**  
**C&PP New Ventures TS&D**  
**2020 Willard H. Dow Center**  
**Midland MI 48674**  
**(517) 636-9287**

The current corporate goal is to continue long-term diversification efforts toward value-added products with equal sales coming from three sectors: basic chemicals and plastics, industrial specialties, and consumer specialties.

Basic chemicals and plastics businesses include automotive materials, propylene glycol, lubricating and fuel additives, ethylene, polyethylene, polystyrene, and caustic soda production. Continued development of manufacturing and waste reduction technology is the core management goal of Dow. The development and introduction of new material technologies, flexible efficient production engineering, and expanded applications are continuing elements of Dow's business diversification.

**Thomas J. Wissing**  
**Eaton Corporation**  
**26201 Northwestern Highway**  
**Southfield, MI 48072**  
**Tel: (810) 354-2720**  
**Fax: (810) 354-2739**

**Engine air management**  
**Materials**  
**Vehicle and appliance electronics**  
**Arc science**

**Vehicle and control technology,**  
**Noise and vibration**  
**Modeling**  
**Test technology**

Dave Hamilton  
E-Systems, Inc.  
P.O. Box 660023  
Dallas, TX 75266-0023  
Tel: (214) 205-7027  
Fax: (214) 205-7052

Image Processing  
Memory Management - High Volume  
Networking  
Multimedia Communications  
High Speed Data Processing  
Advanced Workstations  
Systems Integration

Mark Montesano  
John O'Malley  
E-Systems, Inc., Melpar Division  
44983 Knoll Square  
Ashburn, VA 22011  
Tel: (703) 729-6000  
Fax: (703) 729-7102

Materials  
Communication  
Electronics  
Portable Electronics  
Optics  
Medical Technology

Dr. Hiroshi Takahashi  
Furukawa Electric Technologies, Inc.  
900 Lafayette Street, Suite 401  
Santa Clara, CA 95050  
Tel (408) 248-4884  
Fax (408) 248-8815

Telecommunication  
Networking  
Electronics and semiconductor  
Battery technology  
Advanced ceramic, organic and inorganic materials

**Dr. Tetsuo Shiga**  
**Horiba Instruments Inc.**  
17671 Armstrong Ave.  
Irvine, CA 92714  
Tel: (714) 250-4811  
Fax: (714) 252-0656

Highly sensitive analytical and sampling instruments for the following:  
Heavy metals (Pb, Cd, Cr, Hg etc.).  
Inorganic hazardous gases (F, Cl, HCl, etc.)  
Hazardous volatile organic halide (vinyl chloride, dioxide etc.)  
Hazardous volatile organic compounds  
Inorganic textile like asbestos  
Durable, easy maintenance and low price water quality analysis instruments.  
No analytical instruments especially for medical application  
Micromachining for analytical instrument application  
High speed and small TOFMS for small molecules (1-300 Daltons)

**John C. Wilson**  
**Kimberly-Clark (J.C. Wilson & Assoc.)**  
2807 Sanche Panza Ct.  
Punta Gorda, FL 33950  
Tel: (813) 639-8844  
Fax: (813) 639-1354

Environmental technologies related to air and water quality  
Super absorbing materials (gels)  
Mal odor absorbent materials  
sound absorbing materials  
automatic process control for assembly

**Dr. James Karins**  
**Litton Data Systems**  
29851 Agoura Rd.  
Agoura Hills, CA 91301  
Tel: (818) 706-4495  
Fax: (818) 706-5939

Optical Processing  
C3I  
Neural Networks  
Artificial Intelligence  
Software Re-use  
Hand Held Computers  
Displays  
Virtual Reality



Paula K. Mitchell  
Richard (Dick) Smith  
**Lockheed Advanced Development Company**  
1011 Lockheed Way  
Palmdale, CA 93599  
Tel: (805) 572-2600  
Fax: (805) 572-3076

Electro-optics  
Low Observable Technology  
Advanced Cockpits  
Signal & Image Processing  
Smart Sensors

Advanced Materials  
Electronic Warfare  
Photonics  
Artificial Intelligence  
Advance Guidance & Control Systems

Carlos A. Bedoya  
**McDonnell Douglas Aerospace**  
MC 1066157 - P.O. Box 516  
St. Louis, MO 63166  
Tel: (314) 234-1941  
Fax: (314) 232-4141

Fiber Optics/Photonics/Smart Skins  
Computational Fluid Dynamics  
Aircraft Control Systems  
Global Positioning System/Inertial Navigation  
Composites/Structures for Aircraft/Aerospace  
Aircraft Subsystems - Hydraulics, Electric Power, Cooling ...; Landing Gear, Brakes, Tires

Neural Networks  
Structural Dynamics  
Autonomous Landing Systems

Lowell E. Smith  
Allan G. Roy  
**Newport News Shipbuilding**  
4101 Washington Avenue  
Newport News, VA 23607  
Tel: (804) 380-4342  
Fax: (804) 688-1073

Computer-Aided Engineering (CAE)  
CAD/CAM  
Computer aided work planning, scheduling & tracking  
Non-abrasive surface cleaning  
Marine coatings, surface finishing  
Photogrammetry, non-contact inspection  
Absorbed natural gas storage technology  
Joining, welding, adhesives, fasteners

**Fred Murley**  
**Oshkosh Truck Corp.**  
2307 Oregon Street  
Oshkosh, WI 54901  
Tel: (414) 233-9419  
Fax: (414) 233-9540

Suspension Technology  
Powertrain - Engine/Transmission/Transfer Case Technology  
Communication - Tracking Technology for Flatracks, etc.  
Cooling - High Efficiency  
Corrosion Control Technology  
Weight Reduction - High Strength Steels/Aluminum

**David J. Herzig, Ph.D., V.P. Drug Development**  
**Parke-Davis**  
2800 Plymouth Rd.  
Ann Arbor, MI 48106-1047  
Tel: (313) 996-7482  
Fax: (313) 996-7962

Prescription Pharmaceuticals  
Biotechnology

**Scott Davis**  
**Pratt & Whitney**  
P.O. Box 10960, M/L 707-21  
West Palm Beach, FL 33410-9600

Non-contact devices for machine measurement  
Sensors for various temperature processes  
Process/system simulation software, non-contacting NDE  
Analytical process modeling  
Coatings and compounds  
Life and durability assessments  
Structural analysis and control  
Advanced NDE  
Metal and polymer matrix composites  
Innovative machining techniques  
Innovative fabrication of structures  
Fuels and lubricant development  
Environmental technologies  
Chemical processing technology  
Coating deposition processing  
Coating inspection procedures  
Casting inspection procedures

**A-Lan Reynolds**  
**Texas Instruments Defense Systems and Electronics Group**  
P.O. Box 655474 M/S 228  
Dallas, TX 75265  
Tel: (214) 995-6049  
Fax: (214) 995-3347

Texas Instruments is interested in innovative technologies pertaining to:  
RF/Microwave systems - antenna, composites, nonmetallics, radomes, RTM, computational electromagnetics, solid state microwave products, microwave monolithic ICs, common RF modules, pulsed measurements, AESA, signal processing; photonics; optics;  
Electro-optics - HgCdTe focal plane arrays, cryogenics, ROICs;  
GaAs devices & materials - MBE and MOCVD epitaxy; spectral gas characterization, Xray and Gamma ray detection;  
Microelectronics - power supplies, packaging (MCM & board), switching, interfaces, linear and digital ICs, DSPs, VFETs;  
Signal & information processing & hardware - image understanding, speech processing, multimedia compression, space-time processing, superresolution, ATR, classification, simulation, modeling, neural networks, FPA nonuniformity compensation;  
Environmentally conscious engineering - hazardous materials alternatives.

**Daryle B. Hamlin**  
**Phillip I. Harvey**  
**Unisys Government Systems Group**  
P.O. Box 64525  
St. Paul, MN 55164-0525  
Tel: (612) 456-2121

Environmental sensors                      Agricultural systems  
Computers - software, operational systems, optical networking, optical control systems, semiconductor packaging, image processing.

**George Desormeaux**  
**Lawrence Lagace**  
**Westinghouse - MAO**  
P.O. Box 1021  
Schenectady, NY 12301  
Tel: (518) 385-4457  
Fax: (518) 385-0333

Pressure, Temperature, Flow and Attitude Sensors  
Computer Technology                      Power Electronics  
Fiber Optics Communications              Electronics Heat Removal Devices  
Electronics Packaging

## Awardees

The following listing represents companies who have received either Phase I or Phase II SBIR awards. Included in the abstracts are Technology Categories, Company Description, Project Abstract, Other Corporate Technical Capabilities, and Implementation Strategy.

**Accurate Automation Corp.**

7001 Shallowford Road

Chattanooga, TN 37421-1716

Tel (615) 894-4646

Fax (615) 894-4645

Contact:

Robert M. Pap, Presiden

Richard Sacks, Vice President - Engineering

Reba L. Pap, Director of Administration

*Company Purpose and Goals:*

Accurate Automation is a systems house specializing in the development of neural network technology and its application to controls, signal and image processing, fault diagnosis, and command and control.

*Project Abstract*

As the awardee of ten Phase II SBIR's AAC has developed significant expertise in radar signal processing and multisensor tracking; fault diagnosis in rotating machinery, multiphase fluidic systems, and analog electronics; and the design of neural network based flight control and robotic joint control systems. In support of these activities AAC has implemented a robotic testbed which has been used to experimentally validate a variety of adaptive and neural joint control systems on AAC's (NASA supplied) ESAM robot. Furthermore, we are presently developing a 24 foot hypersonic waverider shaped "LoFlyte" advanced technology testbed on which to test our neural flight control systems.

To facilitate its neural network activities Accurate Automation has developed and sells both a Neural Network Toolbox and a unique Neural Network Processor. The Toolbox is a software package for designing and training neural networks incorporating a variety of neural network paradigms and training methods. The Toolbox was designed under a number of Phase II SBIR's and is presently being converted from C to ADA and parallelized for supercomputers. The Neural

Network Toolbox can be used independently or in conjunction with AAC Neural Network Processor; a special purpose MIMD parallel processor optimized for implementing neural networks in real-time systems. The Neural Network Processor supports up to 8192 neurons and a ten processor system will execute 1.4 Billion connections per second. This system will be available in the summer of 1994 in both PC and VME form factors.

#### *Other Technical Capabilities*

Additional technologies currently being commercialized include AAC's robotic joint control, path planning, and inverse kinematics system; a fault detection and diagnosis system for analog electronics, aerospace, and mechanical systems; AAC's neural network based sensor fusion and neurocontrol technology for automotive and aircraft engines, and its flight control technology. In support of these activities the "LoFlyte" advanced technology testbed will be available in 1995 for testing advanced engine and flight control concepts.

#### *Implementation Strategy*

Accurate Automation is currently teamed with the Lockheed Fort Worth Company, E-Systems, Galaxy Scientific, UNISYS, Telebyte Technologies, and Texas Instruments in its Phase III activities. AAC will license its hardware and software products to other companies and will undertake joint ventures with leaders in their field to apply neural network techniques to real world problems.

#### **Advanced Modular Power Systems, (AMPS)**

4667 Freedom Drive, Ann Arbor, MI 48108

Tel: (313) 677-4260

Fax: (313) 677-3377

email address = hunt@ERIM.org

Contact: Thomas K. Hunt, President, Energy Conversion  
and Small Scale Robotic Systems

Advanced Modular Power Systems (AMPS) is a small business incorporated in the State of Michigan with the principal objective of developing the technology of the Alkali Metal Thermal to Electric Converter (AMTEC) to a level such that reliable, high performance AMTEC systems can become commercial products. AMPS is now in the development phase of several other technologies. Additional AMPS' projects are low cost, advanced, modular robotic hardware and control systems for space and terrestrial applications and advanced, computationally intensive image processing methods. AMPS fully intends to participate in the design, manufacture and profitable sale of such products for space, military and civilian terrestrial applications.

Based on work begun under a NASA SBIR program, AMPS is developing small highly efficient power systems to provide electricity for space applications. These converters are solar heated for near earth orbit applications and radioisotope powered for deep space missions such as NASA's Pluto Fast Flyby. AMTEC

system designs are 5 times as efficient and less than 1/2 the mass of current state of the art space power systems. AMPS is seeking support to continue related system development directed toward providing self-generated electricity to power fans for home furnaces and water heaters. Future development will focus on generation of electricity for general residential use from the variety of domestic fuels used for heating. Projected costs per watt of electrical capacity for these terrestrial AMTEC systems are comparable with those for large, central station electric power plants.

Under a current Phase 2 SBIR program, AMPS is collaborating with the University of Houston to develop a space qualified robotic system to store and manipulate the large numbers of semiconductor wafers required for efficient processing in NASA's Wake Shield Facility.

AMPS plans to complete product development in each of these specific technology areas utilizing SBIR funding and then will proceed toward initial commercial development and manufacturing by seeking to form partnerships with large customers for specific products.

AMPS can provide design, engineering and fabrication services on a rapid turn-around basis. AMPS has a highly capable in-house core team of senior mechanical, electrical, optical and metallurgical engineers and physicists with broad experience in the design and execution of critical experiments in a wide variety of technical fields. AMPS has its own fabrication shop capable of designing and testing laboratory scale engineering prototypes. Special services such as the deposition of thin films by R.F. as well as conventional and reactive D.C. magnetron sputtering and by thermal evaporation can be carried out at AMPS with rapid response times. High temperature vacuum brazing of metals to metals and ceramics to metals is performed routinely at AMPS.

**Advanced Technology Incubator, Inc.**  
31275 Northwestern Hwy., Suite 116  
Farmington Hills, MI 48334  
Tel: (313) 737-9132  
Fax: (313) 737-9341

**Technology Category:** Electronics, Electro Optics, Information,  
Liquid Crystal Displays

Advanced Technology Incubator is a new kind of high technology service for rapid, profitable development of Electronics, Electro-Optics and Information Technologies. Unique in capability and international in scope, ATI brings ideas together:

- Concept proving
- Prototyping
- Intellectual property protection

- Management team formation
- Funding
- Investment opportunities

We have an international network with strong industrial and academic connections in the United States, Europe and the Far East. We provide a mix of skills - in technology, marketing, finance and management - tailored to our customers' needs.

Under SBIR agreement, Advanced Technology Incubator has developed and will present new improved X-Ray viewers. These viewers can eliminate by electro-optical means the glare that adversely effects present viewers. Initial tests at Henry Ford Hospital show a remarkable improvement in medical diagnostics.

ATI is strongly involved with Manning Ventures, Inc. in a number of LCD start-ups that also will be presented.

**Amron Corporation**

2001 Jefferson Davis Hwy., Suite 610

Arlington, VA 22202

Telephone: 703\415-2676

Fax number: 703\415-2665

E-mail address: Sarah\_Steiger@amron.com

Contact person: Sarah Steiger, System Manager

Technology Category: Medical Technology

*Company Description*

Amron Corporation is a small business providing technical support services and products in systems engineering, signal and image processing, and data fusion.

*Project Abstract*

The goal of this Phase I project was to design and test a prototype Home Monitor which extends the period of independence for the elderly. Two models were envisioned; one for private residences, and another for group housing. The product attributes guiding our research include: (1) Affordable purchase or rental; relative to the high cost of a home health assistant, (2) Continuous, non-interactive monitoring; neither a device to be worn nor a "panic button" to be activated, (3) Non-invasive monitoring that respects individual privacy; no cameras or audio microphones, (4) High probability of detecting falls or mishaps and (5) System flexibility; allowing the Home Monitor to adapt to varying requirements.

The Home Monitor can help assure that the person is mobile and cooking and cleaning on a regular basis. It will also detect if stove burners have been left on and determine whether medications have been taken at proper intervals. The Monitor

sounds alarms within the home; for example, to remind the person to take a particular medication. In more serious situations, the Monitor will notify a neighbor or relative, fire or police departments, or a central office. The Group Home Monitor shares many of the same characteristics as the residential monitor. However, a larger CPU will track all of the apartments. Also, fewer sensors will be required, since some of the monitoring in such instances is done in person by the staff.

#### *Other Technical Capabilities*

Currently Amron is working on contract with the Navy to apply the Choi-Williams distribution, a bilinear time-frequency distribution, to transient signals in underwater acoustic data. Amron is also developing an image processing software package for underwater acoustic data. We also have a contract with the Naval Research Laboratory to calculate ocean bottom scattering amplitudes.

#### *Implementation Strategy*

We plan to lease Home Monitors first to senior housing projects in Phase III. We expect that local governments will subsidize part of the cost. The Monitor developed in Phase II should be directly salable in Phase III, without any modifications other than to reduce its price by mass manufacturing. We will demonstrate the Phase II Home Monitor to potential clients at the Phase II test site, a high rise senior housing complex.

For initial sales, we will rely on our contacts in the senior housing community in Virginia, Maryland and the District of Colombia. We expect to build and lease a single Home Monitor in both the first and second years following the end of Phase II. We will also market the Phase II Home Monitor to assisted living and nursing homes.

Later, we will use internal funds to develop new sensors and communication links for a Home Monitor for detached houses. Additionally, we will develop sensors for monitoring the mentally or physically disabled to create a product for this market.



**Antaire Corporation**

414 S. Craig St., Suite 262

Pittsburgh, PA 15213

Phone: (412) 421-9781

Fax: (412) 421-2155

(info@antaire.com)

Contact:

Terry Rajasenan (terry.rajasenan@antaire.com)

Title:

CEO

**Technology Category:** Communication/Information

Antaire Corporation is a Pittsburgh-based software firm in business since 1990. Our mission is to provide tools for the effective dissemination of information. In particular, Antaire's software products and services have focused on improving the efficiency of the healthcare industry.

The Loosely-Coupled Network Database (LCND) is a "middleware" technology designed for distributed Information Retrieval (IR) applications in open systems environments. Phase I of this ARPA-funded project began June of 1992, with Phase II having begun September of 1993. LCND provides scalable price/performance by combining elements of distributed and parallel computing, and offers ease-of-management through a rich suite of systems administration and performance tuning tools.

The aim of LCND development is to permit networked microcomputers to do parallel searches over large databases using client/server technology. We currently have a system running in-house that permits parallel searches over articles from a Clarinet newswire. We are collaborating with the National Technology Transfer Center (NTTC) to integrate the LCND technology with NTTC's distributed document management system. Prototype installation is planned for May, 1994.

Initial potential applications of LCND include: High-performance IR, Multimedia IR, Document management

With additional development, LCND can be used to create organizational productivity tools such as groupware, thereby benefiting cooperative group settings. We are also proposing to market LCND-based applications to the long-term care segment of the healthcare industry (where we have developed a client base) by harnessing LCND to enable new work flows in order to reduce administrative costs. In addition to streamlining the exchange of information throughout healthcare organizations and alliances, this technology can also provide the government with more efficient access to healthcare data.

Aside from LCND technology, other corporate capabilities include healthcare expertise, products, and services. Antaire has been a part of the migration strategies of a number of healthcare organizations, including Manorcare (Silver

Spring, Md.) and Chemed (Cincinnati, Oh.). Other Antaire developments include electronic submission software to Pennsylvania and Ohio Medicare, as well as to the Ohio Department of Human Services. Additionally, we have developed automatic personnel-scheduling software.

Companies marketing or using IR systems and software packages could incorporate LCND into their products to make distributed IR systems with improved performance and cost-effectiveness. We feel organizations such as IR system producers, on-line database companies, government agencies, research organizations, and libraries can benefit from this technology. Cooperative assistance is being sought in terms of technical expertise in IR, healthcare, and workflow areas, as well as staged funding for marketing and added development. Other desired marketing support includes working with possible VARs and systems integrators. Antaire is also looking for venture partners to help develop groupware and workflow tools based on open computing standards.

**APA Optics, Inc.**

2950 NE 84th Lane

Blaine, MN 55449-9998

Tel: (612) 784-4995

Fax: (612) 784-2038

Contact:

Dr. Anil K. Jain, President

APA Optics, Inc. is a technology-oriented company engaged in the development of optical (conventional and binary optics) and optoelectronic (AlGaAs and AlGaIn) sciences with an eye towards product development and manufacturing. So far, the company has developed several products including: binary optic laser scanner (BOLS), binary optic beam splitter, an Interferometer for Aspheric Testing (IAT), AlGaIn based solid state ultra-violet detectors using SBIR programs, and currently involved in the manufacture and marketing of these products.

Additionally, the company has entered in to an agreement with a laser manufacturer to build prototype BOLS with an intent to supply approximately 100 BOLS per year. The company also signed an agreement with AT & T for joint development and licensing of blue lasers, based on the technical advances made in SBIR programs.

At this conference, APA is presenting the compact 2- dimensional Binary Optic Laser Scanner (BOLS), binary optic beam splitter and the UV solid state detector.

The BOLS, developed under the SBIR programs from Eglin Air Force Base for laser radar applications, will find many other commercial applications in several industries such as laser radars, 3-D surface profiling, on site inspection and quality control, and smart sensors. The BOLS has many unique features. The BOLS is compact, and is very rigid. It provides two dimensional scanning without any motors or rotating platforms. Multiple beam splitting from a single laser, multiple beam scanning in two dimensions, and transmitting and receiving can be

accomplished using a single BOLS assembly consisting of two binary plates only. The BOLS can also perform random scans, a feature typically not available in many conventional scanners.

The second product is a solid-state ultraviolet detector radiation detector. It is derived from APA's SBIR contracts in aluminum gallium nitride (AlGaIn) for Wright-Patterson Air Force Base. Covered by several patents, these detectors features high, uniform sensitivity in the UV (up to 365 NM) and very low sensitivity in the visible. The company plans to manufacture both photoconductive and photovoltaic UV detectors. Applications of these detectors include flame/fire sensing and instruments.

The Company is actively pursuing the commercialization of these products. The company plans to supply custom forms of these products directly to original Equipment Manufacturers (OEM) for inclusion in their products, as well as standard products to end users. For the laser scanner, the Company has already established the agreement with a laser manufacturer for a specific application.

The Company has demonstrated the scanner to many aero-space and defense industries for LADAR/LIDAR, missile and smart sensor applications. At present, the company is actively involved in pursuing quality control and 3-D profiling applications for direct sales to the end users.

APA has established an impressive facility and staff of talented personnel for continued development and manufacturing of these products.

**Applied Sciences, Inc. (ASI)**

P.O. Box 579

Cedarville, OH 45314

Telephone: (513) 766-2020

Fax: (513) 766-5886

e-mail: [hagerjw@picard.wpafb.af.mil](mailto:hagerjw@picard.wpafb.af.mil)

Contact: Dr. Joseph W. Hager, Director of Technology Integration

Technology Category: Materials

*Company Purpose and Goals*

ASI is a technology development firm committed to the creation of know-how and to the manufacture and sale of products derived from novel materials. Aided by successful SBIR support and a cooperative development agreement with General Motors, ASI has established a technology base for the manufacture of Vapor Grown Carbon Fibers (VGCF). We have targeted VGCF for near-term commercialization.

***Project Abstract: "Vapor Grown Carbon Fibers"***

**Description:** Highly graphitic discontinuous carbon fibers in -Axial thermal conductivity second only to diamond (~1900 W/m C); Axial thermal expansion low ppm/C to negative; Elastic modulus near single crystal graphite (10X Aluminum); Specific Gravity ~2.

**Application Opportunities:** -High conductivity sheet molding compounds; Low cost, moderate performance composites; High thermal conductivity electronic packaging; Enabling materials technology for thermal management.

***Implementation Strategy***

**Advertise/Educate/Inform potential users.** Establish alliances with potential users for product development; ASI provides expertise and supplies raw material, Partner provides technical specifications and end use market. Become consortium member of ATP, TRP & STTR teams.

**ATEAM Corporation**

4027 Col. Glenn, Suite 400A

Dayton, OH 45431

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**Contact:**

Diane A. Wilkinson, CEO

Kenneth D. Wilkinson, President

David W. Gillespie, Vice President

ATEAM Corporation's highly qualified personnel apply innovative software development and management skills to create expert system software tools that enhance the productivity of personnel at all skill levels. ATEAM's goals are to complete design, development, and management projects at costs substantially below our competitors while exceeding design requirements and customer expectations.

ATEAM personnel have completed various DOD SBIR Phase I, II, and III projects as well as other projects directly for the government and commercial companies. ATEAM Corporation's main business thrusts are to: (1) apply the innovative artificial intelligence and programming skills and techniques to develop software programs that provide the capability to create expert system knowledge models in days, not months - without the user having to write one line of code, (2) use the developed software shells and ATEAM personnel expertise in multiple fields to rapidly create expert knowledge base models that will aid managers, engineers, scientists, etc., in completing their management and design work with reduced resources, time, and training, (3) provide guidance and architecture design to acquire accurate and cost-effective diagnostics of electronic and mechanical systems, (4) provide exceptional software development, systems engineering, design engineering, DOD acquisition guidance, and training to business and government agencies in various fields.

ATEAM Corporation has various implementation strategies for our innovative expert system products and technical and management services. We are interested in applying our technology directly for the end customers, teaming with other companies, integrating our expert system technology with the related products of other companies to provide jointly developed products, providing a license for other companies to develop and distribute expert systems for unique and specialized value added applications, providing a license for other companies to integrate our expert system shells with their products. We are also interested in locating companies to distribute the expert system shells as "shrink wrapped" software as an expansion to their existing software distribution product lines.

Examples of the implementation strategies are (1) providing the existing expert system shells as turnkey systems for other companies and government agencies to develop expert system knowledge models for their unique needs, (2) developing comprehensive expert system knowledge models for our customers, (3) teaming with other companies to develop expert system knowledge models for their customers, (4) developing new expert system software shells or enhancements to the current shells for other companies or government agencies that will provide computer aided guidance to aid in creating expert system knowledge models for many new applications without the user having to write one line of code.

In 1993 ATEAM Corporation received the following awards: (1) SBA Award for Excellence, (2) Wright-Patterson AFB Outstanding Woman Owned Company, and (3) Air Force Aeronautical Systems Center Small Business of the Year.

**Basic Fore, Inc.**  
6101 Pembroke Drive  
Toledo, Ohio 43615  
Tel/Fax: (419) 841-2357

Contact Person: Mr. Herbert Robertson, Vice President

Technical Category: Computer Applications for Dietary Services  
in Health Care

*Method And Apparatus For Planning Geriatric Menus*

Basic Fore, Inc. is a dietetic consulting company that was founded in 1985 to provide dietetic services to long-term care facilities in northwest, Ohio. The company has accounts with 30 different facilities, and is the largest employer of consulting dietitians in the region. The goals of Basic Fore, Inc. are to provide quality dietetic services to the long-term care industry, while advocating resident's rights by enabling them to participate in the selection of the facility's menus.

Basic Fore, Inc. was granted a Phase I SBIR grant from the National Institute on Aging (NIA Grant No. IR43AG10083-01) to test the use of a new patented menu selection apparatus (the Meal Card/ Menu Board System, (MC/MBS)) on 48 volunteer test subjects in two different long-term care facilities in northwest, Ohio.

The food consumption patterns of 24 test subjects at each facility were determined using a weighed plate waste format, prior to the treatment, for three meals per day for one week, while consuming corporate prepared menus. The test subjects then planned their new menus as a group using the MC/MBS, a card game that allows residents of long-term care facilities to choose nutritious balanced meals from a meal card deck (21 meals per week). The same consumption data was then collected on the test residents. The MC/MBS was found to be easily incorporated into long-term care facilities as a menu planning tool; enjoyed by the residents as a meaningful activity; a source of nutritionally balanced meals; and effective in decreasing potential plate waste. A Phase II grant will be submitted to NIA in August, 1994.

This system is being improved to provide: videotape training for the residents on how to play the MC/MBS; videotape training for the food service personnel on portion control; expansion of the meal card deck to include more ethnic, special event and seasonal meals, with a picture of the meal on the back of the card; sized recipes; cost accounting; shopping lists; and inventory control.

This product has applications in any arena that needs assistance in planning menus. Basic Fore, Inc. is currently developing/exploring the following applications of the MC/MBS: a doctor's office "special diets" version; a home version; and a family grocery shopping version. Basic Fore, Inc. is interested in alliances that would promote the product(s) development and national distribution.

**Bio-Technical Resources LP**

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Manitowoc, WI 54220

414-684-5518 (voice)

414-684-5519 (fax)

e-mail: [wk00651@worldlink.com](mailto:wk00651@worldlink.com)

Contact:

Ronald J. Huss, Ph.D.

Director of Research and Business Development

Technology Category: Biotechnology

***Chemical-Specific Bioluminescent Biosensors for Rapid Screening and Monitoring***

Bio-Technical Resources (BTR) is interested in identifying specific environmental, clinical and toxicological applications of our biosensors. We are especially interested in identifying strategic partners to assist in the continued development and commercialization of our bioluminescent biosensor systems.

Bio-Technical Resources is developing recombinant bioluminescent biosensor systems that sense and respond to specific chemicals by producing light. The amount of light produced by the biosensors is a measure of the concentration and bioavailability of the target chemical in the test sample. These rapid, selective, sensitive and easy-to-use tests show promise for near-real time batch screening and

have the potential to be applied to continuous monitoring. Prototype inorganic mercury biosensors have been developed. These biosensors can be used to quantitate 0.2 ppb Hg(II) in less than 15 minutes. BTR's core bioluminescent biosensor system is designed to accept any of a variety of sensing cassettes for toxic metals and certain organic compounds.

*Rapid System for Identifying and Enumerating Microorganisms Using Chemiluminescent Oligonucleotide Probes*

Bio-Technical Resources (BTR) is interested in identifying specific food and environmental applications of our probe technology. We are especially interested in identifying strategic partners to assist in the continued development and commercialization of our probe systems.

Bio-Technical Resources is developing chemiluminescent oligonucleotide probe systems for the identification and enumeration of specific microorganisms. This direct hybridization system may be used to detect whole cells. These rapid tests do not require enrichment, growth or other amplification of the target microorganisms. Selection of target organisms can be controlled to the group, genus and in many cases species level. Chemiluminescence following hybridization demonstrates the presence of the target organism; the amount of chemiluminescence is proportional to the number of target organisms. Prototype test systems are under development for monitoring potable water quality.

*Biocatalytic Hydroxylation of Aromatic Hydrocarbons for Chemical Synthesis.*

Specific hydroxylation of aromatic hydrocarbons represents a significant challenge to the organic chemist, and an opportunity for the application of biocatalysis. Specific ring hydroxylations are a common motif in virtually all aerobic microbial processes for degradation of this class of molecule. We have exploited this microbial capability for the preparation of biocatalysts capable of hydroxylating a wide range of aromatic substrates. Classical enrichment procedures allowed isolation of numerous microorganisms capable of growth on various aromatic hydrocarbons. In a number of strains, mutants have been prepared which can convert the unoxidized aromatic to the corresponding cis-dihydrodiol intermediate. This type of compound can be readily chemically converted to phenols or catechols. Several specific examples of microbial hydroxylations for the production of key polymer components will be given. In one case, organisms capable of converting phenylacetylene into the corresponding cis-dihydrodiol were identified. Chemical conversion of this diol can be directed in situ, resulting in the formation of either ortho- or meta-hydroxyphenylacetylene as desired. For another project, production of the monomer 4-hydroxy-benzocyclobutene biocatalysis was desired. Various environmental isolates were screened and found to oxidize benzocyclobutene in two distinct manners, one of which included formation of a diol intermediate which could be dehydrated exclusively to the desired phenol. Other aromatic hydrocarbons can also be converted to the corresponding cis-diols. In several cases dehydration could be directed to the desired end product. Other hydroxylated monomers can also be produced through biocatalysis. The regio- and enantiospecific introduction of hydroxyl groups into an aromatic substrate also

allows formation of numerous chiral synthons. These may be utilized in a wide range of potential synthetic pathways for the production of optically active pharmaceuticals, agricultural chemicals, polymers, and other compounds.

BTR is a contract research and development biotechnology company. Our core skills include microbial screening, microbial strain improvement, molecular biology and fermentation/process development. BTR conducts technical and economic feasibility studies as well as long-term development programs. In the last three years we have participated in the development of five processes that are at or near commercialization.

**A. J. Boggs & Company**

3512 Green Brier Blvd.

Ann Arbor, MI 48105

Phone: (313) 761-5688

Fax: (313) 761-3114

e-mail: anderson@ajboggs.com

Contact: J. Clarke Anderson  
James D. Anderson

*Company Description*

A. J. Boggs & Company is a management and engineering consulting company founded in 1989 to provide systems integration and engineering services to organizations in manufacturing, health care, and government.

*Project Abstract:*

The project objective is to test the feasibility of new network protocols for integration of a large collection of widely distributed heterogeneous databases and object data repositories into a unified system. Data contained in these databases will include text, graphics, sound, video, etc. The project will provide 2 kinds of services:

1. Index services to increase the ease and efficiency of locating information.
2. Retrieval services to present and conditionally deliver the selected data to the user.

This project will simplify the task of accessing widely distributed databases and reduce both the costs and the time required to search them. The project speeds searching by building a mesh of index servers. This allows very rapid location of resources, and the potential to keep the indices constantly updated. The project facilitates access and retrieval by caching resources located by a query, and allowing the user to preview them before downloading them over low-bandwidth network links. The user sees a unified system instead of a large collection of databases.



The government and private sector can use this system to integrate databases on an enterprise-wide or even industry-wide scale. Organizations can also have a virtual searchable library of all its data.

We have developed and integrated systems using a wide variety of computer architectures, including USL's UNIX, IBM's AIX and OS/2, Novell's NETWARE, Microsoft's DOS and WINDOWS, and SCO's XENIX. We have also worked extensively with the C, COBOL, and Basic programming languages.

*Implementation Strategies*

We intend to take several avenues for commercializing this technology. Phase II will involve scaling this product up to serve widely distributed information services with thousands of individual databases. Phase II will involve the creation of standardized libraries for creating the front end Gopher service for various databases, will involve exploring the use of more sophisticated types of indexing and searching for the index service, and will involve tests with a thousand or more databases.

We intend to offer the opportunity to license the technology to information providers and software developers of database systems. Our customers will be information service providers, database systems developers (systems integrators), and software developers of database systems.

**Canopus Systems Inc.**  
2010 Hogback, Suite 3  
P.O. Box 130319  
Ann Arbor, MI 48113-0319  
Tel: 313/971-4422  
Fax: 313/971-5243  
Contact:

James C. Fox, President

*Business Type:*

Aerospace instrumentation R&D, system analyses and prototype development and verification.

*Technology Area:*

Transportation Sensors/Instrument Systems

*Major Technology:*

Aerospace accelerometry systems design, development, upgrade and operational support

*Major Products:*

Miniature electrostatic accelerometer (MESA) - based instrument systems, Space accelerometry calibration systems, ground/flight configurations, Micromachined sensor-based systems (in development).

*Services:*

Systems engineering analyses, system concept development, preliminary/prototype system design and verification, space qualified instrument system design, fabrication, integration and test.

*Minor Products:*

Infrared sensor-based remote sensing instrument systems, Laser-based electro-optical instrument systems.

*Commercial Applications:*

Avionics inertial sensor instrument systems, Commercial spacecraft accelerometry systems, Commercialized space materials microgravity measurements, Automotive inertial sensor subsystems (airbag, suspension, ABS, etc.), Automation and factory robotics sensors and subsystems, Consumer electronics innovations (e.g. Camcorder LOS stabilization), Airport wake vortex detection and warning systems, Infrared motion detection and industrial security systems

*Technical Capabilities:*

Canopus Systems personnel provide services ranging from phenomenology analysis and systems studies to MIL-SPEC hardware delivery. Specific system expertise is available within Canopus as derived from past and present experience with sensor-based data acquisition instrumented experiment packages for both NASA Shuttle/Satellite programs and DoD remote sensing and hostile environment applications systems, as well as from numerous systems studies.

Canopus Systems offers comprehensive aerospace application instrumentation design services such as: (1) phenomenology analysis, (2) system trade-off evaluation studies, (3) system conceptual design and performance analysis, (4) detail electrical, mechanical, and packaging designs and (5) thermal and structural design and analysis.

Our system support services include: (1) development of MIL-spec documentation and manufacturing drawings, (2) generation of system performance and procurement specifications, test and integration plans and procedures and (3) providing bench/system test and integration operations support and postflight and reflight instrument calibration, alignment and modification support.

*Experience/History:*

Canopus Systems Inc. (CSI) is a qualified small business subcontractor providing aerospace instrumentation system research, design, development, assembly, integration and test services and products to DoD, NASA and commercial customers. One particular area of CSI space instrument system design and development expertise is concentrated in microgravity acceleration measurement systems dating from our staff's experience with the design and development of the Aerodynamic Coefficient Identification Package (milli-g resolution) accelerometry

system delivered for the first Shuttle flight in 1981. This was followed by our staff development experience with the 1983 era High Resolution Accelerometry Package (g resolution) to measure Shuttle Orbiter aerodynamics during atmospheric re-entry. In recent program experience, our staff initiated design and development on the Shuttle Orbital Acceleration Research Experiment (OARE) while at KMS with the contract subsequently donated to Canopus Systems for completion and performance verification. The OARE is a nano-g resolution, in-flight calibrated acceleration measurement system which sets the benchmark for all other Shuttle acceleration measurement devices. The OARE's first mission was in June, 1991 with subsequent flights in 1992, 1993 and 1994. Canopus Systems personnel are currently maintaining and upgrading the OARE system for planned Shuttle flights in the 1994 to 1998 timeframe under contract to the NASA Lewis Research Center.

CSI also maintains a contract with the Naval Air Development Center to provide modification, upgrade and calibration of the Infrared Analysis, Measurement and Modeling Program (IRAMMP) Sensor. The program requires CSI to modify the IRAMMP Sensor by providing a polarization capability, and perform calibration and test, prior to field operations. At a later date, CSI will also perform tasks to restore the sensor to its original configuration.

In a recent internal development and proposal project, CSI has teamed with University of Michigan Center for Integrated Circuits and Sensors personnel to develop conceptual designs for innovative servomicroaccelerometer-based systems utilizing silicon-machined accelerometers and on-chip readout electronics. This microaccelerometry program is oriented toward Government funded prototype development with high potential use of technology transfer for commercialized systems products.

CSI is supported in microaccelerometry and MESA programs by staff members of Canopus Products Inc. (CPI) which is an affiliate of CSI. CPI has acquired the sole proprietary data rights and the assets to manufacture and service the Miniature Electrostatic Accelerometer (MESA) formerly produced by Bell Aerospace Textron. A number of these high resolution devices are currently in use by both NASA and USAF space accelerometry instrumentation programs. CPI was recently awarded a contract for test and calibration of the Space Electrostatic Triaxial Accelerometer for the STEP Mission by the AFMC/ESC at Hanscom AFB.

*Implementation Strategy:*

CSI plans to develop prototype micro-electronic sensor-based systems derived from University-developed sensors with commercial application potential under SBIR/STTR funding from Government agencies. During Phase II prototype demonstration operations, CSI plans to develop strategic partnering associations with manufacturing firms to complete the technology transfer process to the commercial product arena.

**Chace and Associates Engineering, Inc.**

411 Huronview Blvd., Ste. 200

Ann Arbor, MI 48103

Email: cae@mail.mscn.com

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Contact Person: Milton A. Chace, Ph.D., PE, President

Technology Category: Computer Based Simulation and Graphic Display of the  
Dynamic Performance of Machinery and Vehicles.  
Consulting Services and Software.

*Company Description*

Our purpose is to provide high quality consulting services, R&D, software, and inventions for systems characterized by realistic physical motion, including vehicles, machinery, entertainment and training applications.

*Project Abstract*

The following is an abbreviation of the technical abstract accompanying our 1993 State of Michigan Research Award:

Studio quality animation (SQA) is most effective when the motion of the animated objects is dynamically correct. By applying existing engineering methods of dynamic simulation, natural motion in SQA can be economically achieved. We propose a software tool for natural motion SQA meeting the following objectives:

- 1) modular -can be linked internally into existing SQA software, rather than externally to an independent dynamics program.
- 2) arbitrary contact-employs a special architecture for contact-intensive object interactions.
- 3) easy to use-requiring minimal user input.

*Description of Other Corporate Capabilities*

1) Our present, most active corporate capability is that of accident reconstruction. As a consulting service we perform computer-based detailed simulation-reconstruction of machinery and vehicle accidents. Many of our cases involve the dynamic performance of highway vehicle rollovers.

2) We offer design services to the vehicle industry, to avoid vehicle failure during limit maneuvers. In general we can create and exercise fully detailed ADAMS representations of vehicles and machinery through any reasonable maneuver or operation. We can therefore provide major assistance to companies concerned with getting their own products "right" before they are built, or to companies concerned with evaluating their own or competitors products through a matrix of experience too extensive, hazardous or expensive to perform by physical testing alone.

3) We are able to drive high quality graphics with authoritatively accurate computer determined dynamics.

4) We perform software development in areas related to our field of interest. We have to date completed three proprietary software products: Scenic Drive (interactive solid graphics), ALADIN (Alias-ADAMS Interface), and Fast Curves (a plotting program).

We are presently interested in developing an applications program in the field of strength analysis of components. Ideally, this program will enable engineers to conveniently determine the distribution of the strength-to-stress ratio over mechanical components whose properties have been altered by their history of manufacture.

5) We have an outstandingly well-qualified, experienced, capable staff. At present, we are four Ph.D. mechanical engineers, a JD/technical writer and a very capable, tolerant administrative assistant. With this unusual team, we can impact any of a wide variety of mechanical systems challenges.

#### *Implementation Strategy*

We are proceeding well under our own plans and initiatives, but we are open to opportunities consistent with our corporate purposes. We are interested in easing our present major emphasis on short term consulting work in accident reconstruction, and expanding toward a greater content of longer term, creative design work. Possibly a joint venture, alliance or partnership between a larger company and CAE could cost effectively accomplish certain critical research or development work for the larger company, concurrently providing some of the stability, income and creative outlet sought by CAE.

#### **Chemical Concepts Corporation**

912 N. Main St.,  
Ann Arbor, MI 48104

(313) 741-1192

FAX: (313)663-7937

Internet: chm\_ramsay@emuvax.emich.edu

Contact: Bert Ramsay, President

**Technology Category:** Developer of chemistry database and calculation software tools.

#### *Company Purpose and Goals:*

To develop, manufacture and distribute chemistry calculation and software productivity tools for chemistry students, professional chemists, and others in the chemistry field who would benefit from the use of the uniquely designed "chemical calculator."

#### *Project Abstract:*

Chemical Concepts Corporation holds a U.S. patent, and has European and Canadian patent applications for a chemical calculator invented by Dr. Bert Ramsay, a professor of chemistry at Eastern Michigan University. This chemistry database and calculator software productivity tool is presently marketed and

distributed by Chemical Concepts Corporation and some dozen distributors of scientific software under the product name CHEMiCALC. Among CHEMiCALC's unique features is a periodic table (of the elements) interface to facilitate the user's writing of chemical formulas and equations, balancing equations, and other tasks routinely encountered by the practicing chemist in solving chemistry calculation problems. The periodic table interface serves as the "chemist's computer keyboard." Arithmetic errors are reduced as well as detected more quickly by the WYSIWYC (What You See Is What You Calculated) display of calculation set ups and results (including calculation units.)

The CHEMiCALC software presently runs under the DOS (using an optional periodic table touchpad), Windows and Macintosh operating systems. (For the latter system, the periodic table is "touched" on-screen with a mouse click.) The value of CHEMiCALC as a chemistry teaching and learning tool was demonstrated under a N.S.F./S.B.I.R. Phase I study in some 12 high school chemistry programs in the United States and Canada. (As of the date of this abstract, no decision has been made for a Phase II proposal to study the use of handheld devices in high school and college/university chemistry programs.) The primary market for the chemical calculator (as software or as a hand-held device) is still in education, especially for secondary school chemistry students. (There are over 1 million high school students each year in the United States who take chemistry courses.) There is also a large number of potential users among professional chemists, laboratory and field workers involved in chemistry related studies, as well as entry-level chemists, chemistry technicians participating in training as part of a continuous improvement program.

Chemical Concepts Corporation is seeking joint ventures or partnerships to handle the manufacturing, marketing and distribution (US and international) for both the software and hardware versions of the CHEMiCALC product line. Preliminary research and programming is already underway to incorporating CHEMiCALC into PDA productivity devices (Newton, Zoomer, etc.) and related electronic notebook utilities. Stop by booth 202 to see how the Chemical Concepts Corporation products can enhance your company's offerings of scientific software and hardware productivity tools. And even if your company is not in the "chemistry" business, stop by anyway and see how the CHEMiCALC might help your son, daughter or grandchildren become more successful in their chemistry studies.

**Climax Research Services**  
39205 Country Club Drive  
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Contact: Richard B. Gundlach, President  
Edward P. Whelan, Principal Investigator  
James R. Lakin, Business Operations Manager

CRS, a fast-growing consulting firm and research laboratory specializing in metallurgical engineering, was established in 1987 by Richard B. Gundlach, George T. Eldis, and A. Duane Rose, all former researchers at the AMAX Materials Research Center in Ann Arbor, Michigan. Now the company has a staff of 30 and provides a wide range of clients with engineering and testing services. Our mission is to be a full service contract materials laboratory that provides materials testing, consulting and research facilities for a diverse spectrum of materials for local, national and international companies. Our ambition is to use our engineering expertise together with SBIR funding and strategic alliances to research, develop and commercialize our ideas for new products and processes.

Our research on chromium plating sludge waste will result in a metallurgical process that, by using existing technology, will convert the metal values in this hazardous waste into a useful ferrochromium alloy material of major importance to the domestic metallurgical industry. In addition, environmental contamination from toxic chromium VI will be avoided. The ferrochromium will be used as an alloying additive in stainless steel and alloy steel production, and in grey and white cast iron foundries. Since all of the chromium used in the U.S. is originally imported, the recycling of these chromium metal values will help to diminish reliance on foreign markets, and make more effective use of import dollars. While we already have a strategic alliance established for marketing the end product, some financial help for our pilot plant work could be of interest.

Even with many promising R&D irons in the CRS fire, to date SBIR funding has been limited. We are always interested in commercial funding of our research. Many of our research projects have been funded by individual or multiple commercial sponsors. Aside from our research activities, we routinely perform failure analyses and alloy development and characterization. CRS is known as the source for failure analyses in the Midwest. Many testing laboratories in this region refer their more difficult failure analyses to us. We have on our staff experts in: wrought steels, carburizing steels, high strength low alloy steels, cast irons, powder metals, refractory metals, stainless steels, superalloys, hardfacing alloys, aluminum alloys, failure/fracture analysis, image analysis, phase analysis and characterization. In our laboratory we are capable of doing: all types of mechanical testing (fatigue, tensile, compression, shear, bend, hardness, impact and abrasion)

at ambient, cryogenic and elevated temperatures, quantitative metallography (optical and electron), phase transformation analysis, and x-ray diffraction.

**Coalition Technologies, Ltd.**

3072 Vantage Point Drive

Midland, MI 48640

Phone: (517)-832-8415

Fax: (517)-832-3413

Contact:

Dr. W. E. (Bill) Walles, VP R&D, Principal Investigator  
Luis C. Mulford, Dir. R&D, Business Representative

**Topic D: Solid and Hazardous Waste Disposal**

*Company Description*

Coalition Technologies, Ltd. was formed in 1989 to pursue licensing and further research and development of several technologies originally started at, and patented by, Dow Chemical. CTL has exclusive world wide rights to over 20 Dow patents, with rights to sublicense. CTL holds 5 newly issued patents of its own. CTL maintains a research and development laboratory in Midland, MI, a marketing department in Birmingham, MI and a European representative in The Netherlands. CTL goals are to see its technology utilized via licensing or joint ventures.

*Project Abstract*

Utilization of Waste Rubber and Waste Mixed Plastics by Upgrading to a Valuable Additive to Concrete via Skin Sulfonation. All waste plastics and waste rubber tires, roughly estimated at 18 million metric tons in the United States, represent only 5% by weight of the 400 million tons concrete poured annually. About 27% of municipal solid waste is plastics plus rubber. Presently used recycling technologies leave much to be desired with regard to mixed wastes. Particularly, mixed plastics, tire rubber and automotive shredder residue are the big challenge for recycling. We have discovered that after grinding to appropriate size, skin sulfonation makes plastic compatible with concrete. Without sulfonation the particles weaken concrete as they are not wettable. Skin sulfonation provides direct chemical bonds between polymer molecules via sulfonate groups which in turn bond to the calcium silicate network of concrete. Crack formation during curing of concrete is substantially reduced by the addition of skin sulfonated plastics. This translates into higher performing concrete. Practical utility may be selected from reducing the thickness of concrete, reducing steel reinforcement, faster curing, stronger concrete, or a combination of these factors depending on application. Extensive data have been gathered, together with Michigan State University. Our SBIR contract covered a scale up apparatus featuring a vertical silo in which plastic particles fall down while being exposed to sulfonation gas generated and recycled by a patented generator / recycler. The sulfonated skin around each particle is only a few molecules thick, requiring very little chemical.



#### *Other Corporate Technical Capabilities*

- 4.1. Providing, via sulfonation of plastic automotive gas tanks, a diffusion barrier to keep gasoline within the plastic walls and prevent air pollution.
- 4.2. Providing plastic drums and gallon-size portable fuel containers (jerry cans) with a barrier to prevent air pollution.
- 4.3. Providing plastic with a water wettable, non-fogging, anti-static and non dust attracting surface. This can be used for ski goggles and plastic lenses.
- 4.4. Providing textiles with breathability, such as nylon and polyester shirts and fire resistant safety suits.
- 4.5. Providing plastic medical devices with a water wettable surface, such as blood filters, blood oxygenators, etc. preventing the formation of air bubbles.
- 4.6. Providing medical plastic with a low cost coating containing heparin which prevents clotting of blood.
- 4.7. Removal of mercury from waste fluorescent lamps.
- 4.8. Removal of hydrocarbons, PCB's, Dioxins and heavy metals from contaminated soil.
- 4.9. Time release coatings via a novel coating providing burst release between 1 week to several months.
- 4.10. CTL has technology to overcome the problem of leaking gasoline in-ground tanks. It avoids digging out the tanks by providing an inner plastic coating over a porous matrix. The plastic is sulfonated to resist gasoline penetration and the porous matrix permits continuous leak and permeation testing.

#### *Implementation Strategy*

CTL will directly license its technology, in joint ventures, partnerships and also perform contractual R&D.

#### **CoGenTex, Inc.**

840 Hanshaw Rd., Suite 5

Ithaca, NY 14850-1589

Tel. (607) 266-0363

Fax (607) 266-0364

Contact person:

Dr. Tanya Korelsky, Vice-President for Applications

e-mail: tanya@cogentex.com

Technology category: Communication/Information

#### *Company Purpose And Goals:*

CoGenTex uses advanced knowledge-based and linguistic technology to build systems that automatically produce fluent textual reports and other documents from computer-accessible data. The company's proprietary text generation software ensures that the documents produced are accurate, effective and easily maintainable. Documents can be generated in multiple languages, and comply with customer-defined writing styles. CoGenTex also develops customized software to help ensure that human-composed text adheres to writing standards that already exist (e.g., AECMA Simplified English), or which can be defined to meet

local needs. We use this software in systems that support the development of administrative and technical procedures. Our systems are implemented primarily on SUN, Mac and PC workstations.

*SBIR Products, Services And Technology Benefits*

As a Phase II SBIR awardee from Rome Laboratory (RL), CoGenTex is building a project monitor and progress/status report generator, called Project Reporter. The first application of Project Reporter is to the software development process, as embodied in the DoD-STD-2167A and its successor, MIL-STD-SDD. For this application, Project Reporter was integrated with the Software Life Cycle Support Environment (ProSLCSE), sponsored by RL. A standalone version of the Project Reporter is also being developed. Project Reporter will help DoD contractors to maintain the history of their projects, to enforce full compliance with contract schedules and deliverables, and to automatically generate status and progress reports according to the DO-MGMT-8027 and other government standards. Reports are accompanied by tables and charts (such as Gantt charts) as necessary. Project Reporter is based on a comprehensive process model which allows it to be customized to various industrial and business processes outside of software development.

Another SBIR contract (currently in the project continuity Phase, with Phase II awarded) uses linguistically-based text generation technology to automatically produce software documentation from information stored in CASE (Computer Aided Software Engineering) databases. We are concentrating on two areas in particular: (1) building a Graphical User-Interface (GUI) Documenter which produces end-user instructions (manuals, on-line help messages, training material) from information captured by a GUI Builder, and (2) building an Entity-Relationship (E-R) Diagram Explainer, which produces certain types of requirements summaries from information represented in E-R diagrams.

*Other Corporate Technical Capabilities:*

CoGenTex, Inc. has built automatic report and documentation generation systems in other domains such as weather forecasting (fully operational), statistical database summarization (in beta test), and job description (prototype completed). We can build text generators and style checkers/correctors for several languages besides English, and have extensive experience in automatic parsing and language translation. Our customizable procedure development system core allows procedure experts to produce textual procedure descriptions from edited flowcharts, or conversely, produce flowcharts from edited procedures.

*Potential Joint Ventures, Partnerships, Etc.*

CoGenTex, Inc. is ready to market customized systems of the kind described above. For Project Reporter, which is highly customizable and portable, CoGenTex seeks partners who develop project management tools or process support environments. For GUI Documenter and E-R Explainer, we are interested in partnership arrangements with vendors of CASE tools and GUI building tools.

### **Communication Disorders Technology**

205 S. Walnut Street  
Bloomington, IN 47404  
Tel: (812) 336-1766  
e-mail: cdtinc@indiana.edu  
FAX: (812) 332-7365

#### *Company Description*

In December 1989, Communication Disorders Technology Inc. (CDT), was formed by Charles S. Watson and Diane Kewley-Port, both professors in the Department of Speech and Hearing Sciences at Indiana University and Daniel P. Maki a professor in the Mathematics Department also of Indiana University. CDT founders have been awarded over \$1,100,000 in grants for the development and clinical testing of the Indiana Speech Training Aid (ISTRA) System. The ISTRA system will fill a widely-recognized void in the speech training aids market. CDT's goal is to become the market leader in the development of new technologies for speech and hearing professionals (speech pathologists and teachers of the deaf) and for teachers of foreign languages. Presently CDT efforts center on the evaluation and implementation of commercial speech recognizers in low-cost personal computer technology as the platform for product development.

#### *Product*

CDT is now prepared to aggressively market the Indiana Speech Training Aid (ISTRA), a computer-based speech training aid that employs speaker-dependent speech recognition. Speech drill is provided in interactive, video-game formats including, for example, 'baseball' and 'moon ride'. The system has been extensively clinically tested for over five years at the Indiana University Speech Clinic and in Bloomington elementary schools. The first generation product is being sold locally, with a second generation system coming on-line for national sales during the third quarter of 1994.

#### *Market*

A market study originally prepared by a team from the Indiana University Business School has estimated the market potential for CDT's first product, ISTRA, to be in excess of 100,000 units (\$150,000,000). Customers for ISTRA are the 65,000 speech professionals in schools, private clinics and hospitals.

#### *R&D Program*

CDT received an SBIR Phase II research grant in training aid with state-of-the-art animation. Applications of speaker-independent technology in a new product, PRONTO, to teach English to non-native speakers began development in January, 1994 under SBIR Phase I funding. The market potential for this product application in second-language training is worldwide and growing. It is at least several times larger than the market represented by children and adults with speech disorders.

*Financing*

CDT wishes to acquire a business partner to support aggressive marketing of the ISTR A product. The strength of CDT lies in its R&D capabilities for the use of speech interfaces in instructional technology. CDT wishes to enhance these strengths in research and development and initiate a national marketing campaign for the ISTR A product through a partnership or strategic alliance.

*Management*

Charles Watson, President  
Diane Kewlcy-Port, Executive Vice-President  
Daniel Maki, Vice-President of Finance  
Jonathan Dalby, R & D Manager

The three founders of CDT are on the Faculty of Indiana University and have established national reputations in the fields speech and hearing sciences and mathematics education.

**Cybernet Systems Corporation**

1919 Green Road, Suite B-101

Ann Arbor, Michigan 48105

Phone: (313) 668-2567

Fax: (313) 668-8780

EMS: Internet / MCI ID: 376-5414

MBX: heidi@gateway.cybernet.com

Contact: Heidi N. Jacobus, President

Technology Categories: Communication/Information, Medical Technology  
Environment, and Robotics

*Company Description:*

Cybernet Systems, a woman-owned small business firm focused on high-technology engineering and development services in Human Computer Interaction, Virtual Reality components and systems integration, Artificial Intelligence, Robotics and Automation, and Electro-Optical/ Mechanical Systems, has organized its business to provide value to its customers. Cybernet performs contract engineering services and R&D activities to Government and commercial companies.

*Project Abstract:*

We will demonstrate our universal (computer controlled) six axis force reflecting robotic handcontroller technology. This force reflecting 6 axis control stick subsystem has been built to successfully control two NASA teleoperated robotics test bed systems in Houston (one which controls a Robotics Research robot system and one which interfaces into a virtualization of the Space Station Freedom). This project generated very favorable press coverage in NASA Tech Briefs, May 1992.

*Other Technical Capabilities:*

Cybernet activities have focused on exploring the boundary between human performance and the machines that we control. Prior completed projects include work in Human-Computer Interaction, Virtual Reality, Artificial Intelligence, Robotics, and Automation technology development. We implement systems using state of the art blending of hardware and embedded software, to employing Commercial Off-the-Shelf technology wherever applicable to solve our customers' problems, and introduce spin-off commercial products from R&D activities whenever it is feasible.

**Daedalus Enterprises, Inc.**

P.O. Box 1869

Ann Arbor, MI 48106-1869

Phone: (313) 769 5649

Fax: (313) 769 0429

Contact: Keith A. More, Manager, R&D Sales

Category: Instrumentation

*Company Purpose and Goals*

Daedalus is the leading, worldwide manufacturer of airborne multispectral scanners. Over 85 systems are now operating in 24 countries. R&D goal is to develop new technology for airborne scanners through customer funded R&D.

*Project Title: Large Area Fast Spectroradiometer*

Abstract: A field portable hyperspectral camera that covers the visible through near IR spectral range is being developed for the U.S. Navy/Marine Corp. The camera is to exploit hyperspectral feature detection of land mines and other camouflaged military targets. Key features are: field portability, 256 spectral samples, 400 to 1100 nm spectral coverage, 256 x 256 element field size, wide field and telephoto lenses, and 0.5 to 1.0 sec frame time.

The camera could be mounted on a vehicle mast for reconnaissance or mounted in a UAV for airborne reconnaissance.

*Corporate Technical Capabilities*

Design and manufacture of airborne multispectral scanner systems, 3D sensor development, airborne laser scanner development, and electro-optic sensors.

*Implementation Strategy*

Daedalus is a commercial products manufacturer. We seek an alliance with a military products manufacturer to develop multispectral sensors for Warbreaker and other military applications of multispectral target detection.

**Derivation Systems, Inc.**

1800 East Maxwell Lane

Bloomington, IN 47401

Tel: (812) 334-2903

Fax: (812) 334-1271

E-mail: bosc@dvs.com

• Contact person: Bhaskar Bose

Title: Director R&D

Technology Category: Formal Methods in High Level Synthesis.

*Company Purpose:*

Derivation Systems, Inc. is a computer software development company incorporated in the State of Indiana. Our corporate mission is to move formal methods into engineering practice. We are dedicated to developing practical CAD synthesis tools based on formal methods to build reliable hardware realizations.

*Project Abstract:*

The promise of formal methods to eliminate design errors in safety critical systems is realizable, however, much of the technology remains academic or removed from current engineering practice. At Derivation Systems, Inc. we believe that in order for formal methods to reach their full potential, a formal design tool must support the generative and deductive aspects of design. We also believe that for a formal design tool to be practical, it must integrate with existing logic synthesis tools to generate hardware realizations. The specific project we are currently developing is the Derivational Reasoning System (DRS), a design tool which reflects a formal approach to digital design founded in derivational reasoning. The significance of DRS is the development of a design tool which integrates derivation with existing verification and logic synthesis, holding advanced degrees with extensive experience in formal methods research, programming languages, high level synthesis, and hardware.

*Implementation Strategies:*

A design methodology based on the algebraic manipulation of purely functional forms provides the basis for our derivational reasoning framework. In this methodology, derivation, a formalization of synthesis, is used as the primary mode of reasoning in deriving an implementation from an abstract specification by the application of correctness preserving transformations. Transformational algebra to perform data abstraction is then employed to isolate key components of the design for verification. These components are then verified in an existing theorem prover. The final implementation is then input to existing logic synthesis tools to generate hardware realizations. We are actively seeking technology partnerships with companies interested in integrating our technology into their design framework. We believe the application of formal methods to hardware design extends the capabilities of what can be reasoned about in existing CAD systems today.

**DESE Research, Inc.**  
315 Wynn Drive  
Huntsville, Alabama 35805  
Office: (205) 837-8004  
Fax: (205) 722-7966  
Point of Contact for IES/LAS: Dr. Robert M. Smith

*Goal and Purpose:*

DESE Research, Inc., was founded in 1982 with the goal of providing high quality research and engineering services to governmental agencies and private industry. The business areas of interest to the company encompass the fields of **DEFENSE, ENERGY, SPACE, and ENVIRONMENT**. DESE is established as a small business under the Federal Regulations of Title 13, Section 121.3-8 (SIC Code 8711).

*Project Abstract*

DESE recently completed work on a Phase II SBIR entitled "The DESE Image Enhancement System (IES)." The IES is a revolutionary set of algorithms for image enhancement, processing, and target discrimination. The effectiveness of this system has been demonstrated in the accurate identification of different satellite configurations and selection of precise aimpoints for an Anti-Satellite (ASAT) weapon system based upon IES images.

*Other Corporate Technical Capabilities*

DESE experience includes systems engineering, design, analysis, and integration in a variety of military systems. Systems engineering projects have addressed Ballistic Missile Defense (BMD), anti-satellite (ASAT), and Theater Missile Defense (TMD). While technical support services represent the core of DESE business base, we continue to focus on the development of innovative technologies. The DESE IES system is a example of our most successful initiative. Other major innovative technologies include the Life Assessment System (LAS) and remote sensing technology.

The LAS package provides new, unique, and innovative methods for predicting failure rates, survival times, restoration time, and availability times. LAS lets the data provide the basis for decision-making and then utilizes DESE proprietary statistical tests to identify the best distribution for reliability assessment. This package is currently being field tested on the B-52 to accurately assess the life characteristics of sealed ni-cad batteries. Advances in sensor technology have allowed small, non-intrusive sensors to capture the data necessary to perform this state-of-the-art analysis. LAS represents a leap ahead technology for the prediction and assessment of reliability, availability, and maintainability.

In the area of remote sensing, DESE has developed an extensive knowledge base related to molecular spectroscopy through a series of programs. Specific system concepts include:

- Remote sensing using Coherent Anti-Stokes Raman Spectroscopy (CARS) for compliance verification monitoring under the Chemical Weapons Convention
- Airborne remote sensing system for drug detection using visible wavelength Raman spectroscopy
- In situ river monitoring system using near-IR Surface enhanced Raman Spectroscopy (SERS) and Surface enhanced resonance Raman spectroscopy (SERRS)
- Evanescent Wave Fiber Optic Sensor for Volatile Organic Chemicals (VOCs) and Dense Non-Aqueous Phase Liquids (DNAPLs) Using Near-Infrared (IR) Fourier Transform (FT) Raman Spectroscopy.

*Description of Implementation Strategy*

IES was originally developed to determine the optimal aimpoint for threat satellites in an extremely time critical, real-time environment. In addition to defense applications, the IES can be adapted to solve other complex problems such as the determination of eye disease from images of the eye, automatic generation of optimal laser placement and energy control for retinal surgery, automated mammography screening, radar image enhancement, and the detection and prediction of significant weather events.

**Dimension Technologies Inc.**

315 Mt. Read Blvd.

Rochester, New York 14611

Phone: (716) 436-3530

Fax: (716) 436-3280

E-mail: dti@transit.nyser.net

Contact: Arnold D. Lagergren

DTI was founded in 1986 to develop and market unique liquid crystal based autostereoscopic displays. An autostereoscopic display is an electric system that provides three-dimensional (3D) imaging without requiring the observer to wear special glasses. The company's product line and technical capabilities have grown steadily through the development of innovative packages of lenses, backlights, and high speed electronics for advanced 3D display systems.

More recently, DTI has experimentally applied its technology to more general enhancements of Liquid Crystal Display (LCD) performance in producing 2D images, including means to create color images on a monochrome LCD using a novel field sequential color (FSC) illumination technique, and means to create images on an LCD that possess more resolution than the LCD itself.

DTI has received a total of eight (8) Phase I SBIR contracts and two (2) Phase II contracts from NASA, DOD, and the NSF. All but one have been related to advancing the company's autostereoscopic technology. The remaining Phase I SBIR grant was related to the development of the new field sequential color



illumination technique. The autostereoscopic technologies developed under these programs are now being incorporated into commercial products. The company is developing prototypes for and plans to license or manufacture advanced illumination systems for 2D imaging.

Presenting visual information in three-dimensional stereoscopic form has been proven to be of benefit in applications such as medical imaging, telerobotics, industrial inspection, avionics, and scientific visualization, among others. However, the use of and acceptance of stereoscopic display systems has been limited because users must wear special polarized glasses or liquid crystal shutters to view the images. DTI's systems allow the user to view stereoscopic images naturally, simply by sitting in front of the display and looking at it, as one would look at any other electronic display.

DTI's field sequential color and enhanced resolution technology address two problems associated with liquid crystal display technology; namely the higher cost and lower yields associated with creating color on an LCD or increasing image resolution by adding additional addressable picture elements (pixels); and the lower light throughput resulting from the use of color filters and small pixels. DTI's techniques overcame these problems by using lower resolution, but faster, LCDs in combination with time sequential illumination and optics that provide color, increase resolution, or both.

DTI is seeking business relationships with companies who are capable of manufacturing liquid crystal displays or are interested in manufacturing liquid crystal display based direct view, front projection, or rear projection systems for desktop, presentation, and entertainment applications. DTI's autostereoscopic and field sequential color illumination technology can greatly enhance the performance of such displays.

**Early Detection, Inc.**

Box 71169

Milwaukee, WI 53211

Phone 414-529-6500

Fax: 414-529-6505

Contact:

James Harasymiw, PsyD, CADC III, President

Technological Category: Medical Technology/Instrumentation

Early Detection, Inc. (EDI) is a venture organized to develop and market a unique and patented method of determining an individual's drinking pattern over the previous four to six weeks -- the Early Detection of Alcohol Consumption test (EDAC).

Alcohol abuse is a costly problem to society, both in terms of dollars and in terms of the health and well being of abusive drinkers and their innocent victims -- those

suffering injury or death at the hands of the abusive drinker. The EDAC can be used to identify and, therefore, provide proper solutions to the problem, depending upon the application. EDI has accomplished this through a proven method of statistically comparing blood sample variables from various subjects in order to develop reference panels which are then used as a base guideline. The EDAC blood serum panel includes 30 commonly run blood chemistries. The subject blood serum panel is statistically compared with a pre-existing reference panel of alcohol consumption rates. This provides the approximate alcohol consumption rate and, therefore, the presence or absence of probable alcohol abuse.

Development to date proves the EDAC as an effective, low-cost, general screen which needs to be validated either through interview or another test. However, by the end of 1994, we expect to refine our norms so that the EDAC could also be used as a confirmatory test. We also expect to begin research on adolescent and geriatric norms, as well as exploring any racial variations in the Asian, Hispanic and Native American populations. Application for FDA approval is in process.

Applications of the EDAC are many. It can be effective in employee assistance programs, testing of commercial drivers and employees in high-risk jobs, insurance risk determination, drunk driving assessment and compliance, the criminal justice field in regard to domestic abuse and public violence and, of course, clinical applications of diagnosis of substance abuse and treatment compliance. We see the EDAC as very useful in national health care programs -- *early treatment is usually more successful and saves long-term health care costs.*

EDI has begun some partnering relationships with Home Office Reference Laboratory, Primus Corporation and Centurion Employee Benefits. We envision forming local strategic alliances with a variety of wellness or health delivery services, EAP's and government agencies.

#### **Energy Materials Research**

132 Chalmers Dr.

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Fax (810) 370-3408

EMS: Internet / MCI ID: 376-5414

MBX: searight@vela.acs.oakland.edu

Contact: Dr. Carl E. Bleil

Technology Category: Materials

#### ***Purpose:***

Energy Materials Research (EMR) is a for-profit company dedicated to the research, development and prototype proving of commercially exciting concepts in energy related fields.

*Technical Abstract:*

EMR is developing an innovative new process for the production of very thin (single crystal) silicon sheets from polycrystalline source material. A prototype semi-continuous processor is under construction. The processor is based on analyses of the physical and thermal behavior of the process with materials like silicon. Six patents protect the developed process. The expected first result is a very low cost high purity single crystal silicon sheet.

Based on expected cost reduction of 60% for single crystal silicon, marketing analysis indicates an immediate major market in solar photovoltaics and a significant market potential for electronic grade materials. Processors which will amortize in a few months, also provide an attractive market.

*Company Technical Capabilities:*

EMR was organized in 1984 by Carl E. Bleil, Ph.D., a physicist with over thirty years of experience with GM Research Laboratories. Dr. Bleil has worked in the area of crystal growth for over ten years. His hands-on pioneering experience also includes electron and x-ray diffraction as well as optical and electron microscopy. Dr. Bleil is an Adjunct Professor of Physics at Oakland University in Rochester, Michigan and is listed in the American Men of Science. He is the inventor of record for 17 patents.

Dr. Bleil's innovative unit-sized germanium crystal growth process was profitably used for years by the GM's Delco Electronics Division. His current interests are in material science including crystal growth, thin films and electronic displays.

*Commercialization Strategy:*

Prototype thin silicon sheet processor development is funded by a DOE grant. Project completion is expected within 18 months. Evaluation of the resulting silicon sheet will take another six to nine months. First applications are expected in the solar energy field.

Strategic alliances developed during evaluation and initial product application are expected to lead to processor manufacturing and production licensing for the solar industry, (and later for the electronics industry). EMR will provide technical direction for the alliance companies whose products incorporate EMR processes and/or products. Revenue from licensing and technical direction will fuel rapid introduction of low cost electronic grade silicon sheet into the domestic and world markets.

**EXPORTech Company, Inc.**  
Building 242, Schreiber Industrial District  
P.O. Box 588  
New Kensington, PA 15068-0588  
(412) 337-4415  
FAX (412) 337-4470  
Contact: Dr. Robin R. Oder, President

Technology Category: Other (Process Technology)

*Company Purpose and Goals:*

EXPORTech Company, Inc., (ETCi) has completed laboratory development of a novel liquid separation technology. ETCi's goal is to commercialize this technology via license, sale or joint venture formation.

*Project Abstract: The MagneCoal Process; Magnetostatic Coalescence*

EXPORTech Company, Inc. (ETCi) has established the technical feasibility of using practical magnets to separate immiscible liquids of virtually any concentration. To illustrate the method a stable emulsion containing 16.4% water was prepared using reagent grade paraffinic mineral oil and was processed by ETCi at ambient temperature in a low level magnetic field. Greater than 99.9% of the water was removed from the emulsion, including connate water in the reagent grade mineral oil, while more than 99% of the water-free mineral oil was recovered. In addition to processing model compounds of water and mineral oil in a continuously operating laboratory scale coalescer, we have also carried out successful testing of desalting and dehydration of crude oils and dehydration of gasoline.

The MagneCoal Process (Patent Pending) can develop magnetic forces which are very large compared to those of viscosity, gravity, dielectricity, and interfacial tension. This permits continuous high-throughput mechanical separation of liquid components of virtually any concentration. Residence times are minutes rather than hours or days. The process does not develop or use heat or high tension electric fields; electrodes are unnecessary. Testing indicates that the method can be scaled to large throughput. The MagneCoal Process may be used where tight emulsions are encountered, internal phase concentrations in the ppm range are to be achieved, energy consumption and safety are problems, or large volumes of emulsion are to be processed. Opportunities exist for application of the method in the petrochemicals, minerals, pharmaceutical, pulp and paper, microelectronics and environmental industries.

The next stage of development will be fabrication and operation of a pilot unit such as a five-gallon per minute skid-mounted unit which can be used for demonstration purposes.

*Other Corporate Capabilities:*

ETCi owns patents and proprietary technology in the areas of dry magnetic separation, combined agglomeration and magnetic separation, and in electrostatic coalescence and magnetostatic coalescence technologies.

*Implementation Strategy:*

ETCi is seeking a partner to support further development and to supply marketing capabilities in exchange for a share of the rewards. The new technology offers the opportunity for sales of the new separation technology and equipment as well as for process engineering. ETCi will consider a licensing arrangement, joint venture, strategic alliance or sale of the technology.

**Faraday Technology, Inc.,**

(FaraTech)

3155 Research Blvd., Suite 105,

Dayton, OH 45420-4011.

Phone: 513-252-2113,

Fax: 513-252-2131.

E-mail: [Jennings@cwchme.chem.cwru.edu](mailto:Jennings@cwchme.chem.cwru.edu).

Point of Contact: Dr. E. Jennings Taylor  
President & Chief Scientist

Technology Category: Environment, Remediation, Sensors  
& Corrosion

*Corporate Mission, Goals & Strategy:*

Faraday Technology, Inc. (FaraTech) was founded in September 1991 to develop and commercialize novel electrochemical technologies. The corporate focus is based on the application of electrochemical or materials science concepts to the development of technologies and instrumentation for hazardous waste reclamation and real-time process monitoring and control. FaraTech's strategy is based on developing and patenting technologies which are commercialized via 1) private placement funding, 2) joint ventures, 3) R&D partnerships, 4) strategic alliances, or 5) licensing.

To date, these strategic alliances include 1) Electronic Design Center in Cleveland Advanced Manufacturing Center located at Case Western Reserve University, 2) Printed Circuit Board Branch, Naval Surface Weapons Center-Crane Division, 3) University of Dayton Research Institute, 4) Gem City Engineering Corp., 5) Physical Sciences, Inc., 6) Circuit Center, Inc., and 7) US. Naval Academy. In addition, FaraTech has secured funding from commercial sources and government agencies including 1) Advanced Research Projects Agency, 2) Department of the Navy, 3) Department of Energy, and 4) Delco Chassis Division of General Motors Corporation.

*ONR SBIR Phase II: Remote Sensing of Crevice Corrosion:*

Crevice corrosion is a form of localized corrosion that occurs within crevices or shielded surfaces where stagnant solution is present. Crevice corrosion is particularly problematic for the Navy in networks of seawater piping where numerous gasketed junctions are susceptible to crevice corrosion. Since the crevice corrosion is almost always confined to within the crevice itself, the pipe joints must be periodically disassembled and visually inspected for evidence of crevice corrosion. This process is time consuming, tedious, and expensive. In the SBIR Phase I program funded by the Department of Navy, we demonstrated the feasibility of a magnetic field based measurement concept for sensing the crevice corrosion at the pipe joints. Our Phase II developmental efforts are to optimize the parameters involved with our technique & demonstrate with measurements on a real, seawater piping loops. We envision that our developmental efforts in SBIR Phase II program funded by the Department of Navy will lead to a portable instrument with a small magnetometer probe to detect the crevice corrosion in the pipe joints externally. This instrument will eliminate the need for disassembly, visual inspection of the pipe joints of piping networks on the ships & ship yards. Although the technique is being developed under the funding from the Department of Navy, the technique or the instrument will be of great benefit to the corrosion monitoring of the piping loops in Power Plants, Oil Refineries & Paper Mills.

*DOE SBIR Phase I: Field Portable Instrumentation for Metal Analysis:*

Anodic Stripping Voltammetry (ASV) is a well established electroanalytical technique for measuring trace metals in water. Combining this technique with micro-sensors will lead to real-time monitoring of trace metals. In Phase I we demonstrated the ability to measure trace metals in the 10 ppb range.

*Other Corporate Capabilities:*

Our capabilities other than above mentioned are in the area of development of electrochemical sensors for variety of applications, development of environmental remediation technologies for clean-up efforts & packaging the sensors. Specifically, we have (a) a proprietary process innovation for clean-up of waste waters, (b) non-mercury based electrochemical sensor for sensing metals, (c) proprietary software & hardware for heavy metal monitoring unit for copper & lead in aqueous systems.

**Full Circle Systems**

32 Cherry Tree Rd.  
Loudonville, NY 12211-1604  
(518) 462-1407

FAX same as voice, but you must call via voice first so that I can turn switch to receive fax.

Contact: Samuel V. Johnson, Ph.D., CEO

Technology Category: Medical Technology/Ergonomic Tool Control Devices

*Company Description*

Full Circle Systems develops and manufactures ergonomic tools, devices, and furniture.

*Project Abstract*

Full Circle Systems has developed a new design for tool handles. The new design allows the user to hold the hands perpendicular to the direction of the push/pull, with the point of contact being spread over a large area of the palm. The wrists are straight; both arms can be held at the same low level; and the back remains straight.

Use of this handle will reduce the occurrence of blisters, callouses, cramped muscles, sore backs, and cumulative trauma disorders. It may prevent disorders such as carpal tunnel syndrome, and it may allow patients with disorders such as arthritis or diminished grip, to use tools more comfortably.

The objective of the SBIR proposal was to measure the effectiveness of the new handle as well as to answer specific questions concerning the detail of the handle design. This research helped insure that the new tool handle maximizes its benefit to a variety of users.

*Other Technical Capabilities*

Computer Consulting

*Implementation Strategy*

Our strategy is to license the use of this handle to tool companies and to manufacture and supply the handle to tool companies.

**Global Information Systems Technology, Inc.**  
Champaign, IL  
217-352-1165

*Re-Usable Instructional Strategy Templates for Efficient Computer-Based Training Development and Delivery*

Global is using Phase II SBIR funds to create a Computer-Based Training (CBT) authoring product, to be integrated with our current full-featured authoring system,

**TIE.** TIE is a Windows-based authoring system using icons and provided dialog boxes and subroutines to help authors create very complex CBT lessons and other multi-media presentations in a programmerless environment. TIE is Global's third generation CBT system and runs in both DOS and UNIX.

We are currently identifying instructionally-sound CBT strategies and creating re-usable templates for authoring efficient and effective CBT lesson interactions. These strategies can be used together in an object-oriented environment somewhat like clipart. An example of such a strategy is a drag-and-drop lesson sequence, where the student drags an object (e.g., a picture or piece of text) from one location and places it in a relevant second location; upon completion of the task, the student receives feedback. Such a strategy would be useful for tasks requiring classification, identification, or location of objects or parts. The template helps authors define a background, drag objects, drop zones, and feedback, as well as a number of other options (e.g., number of tries a student can have before seeing the correct solution). A test case determined that a strategy that currently takes an experienced author 15 hours to code could be authored in only 15 minutes.

**H & N Instruments, Inc.**  
219 North Westmoor Avenue  
PO Box 4338  
Newark, OH 43058-4338  
Tel: 614-344-7958  
Fax: 614-344-4351  
Contact:

Dr. Gary M. Nishioka, President

**Technology Category:** Medical Technology/Instrumentation

*Company Purpose and Goals:*

H & N Instruments was founded in 1987 to advance the understanding of surface-associated phenomena through the development of advanced research instrumentation.

*SBIR Phase II Project Summary:*

Techniques and instrumentation for the synthesis of immobilized combinatorial libraries are being developed. These libraries will ultimately consist of large numbers of related biologically active compounds immobilized on a support and arranged in a well defined array. For example, a library could be used to investigate a hypervariable region in a protein. The library would consist of all possible variations in 6 positions in the protein and would comprise an array with 8,000 rows and columns (64 million members). The position of each spot in the array identifies the sequence of the hypervariable region; each spot is approximately 50 micrometers in diameter.



Our technology is unique in the relative ease and speed with which these libraries can be created. These libraries are easy to use, requiring little specialized training of the user.

The targeted commercialization route arising from this technology is the diagnostic products business. Arrays of biomolecules will attract various species at characteristic sites on the array. Immobilized libraries may thus function as a generic sensor, capable of detecting and identifying a wide variety of biomolecules such as viruses, antibodies, or tumor associated antigens.

*Corporate Technical Capabilities:*

H & N Instruments develops new techniques and instrumentation by combining its resident expertise in Surface Science and Laboratory Automation. H & N Instruments has been awarded 5 Phase I SBIR contracts and 3 Phase II SBIR contracts from the Army, NASA, and NSF to develop novel instrumentation. H & N Instruments has also conducted numerous investigations for private companies.

H & N Instruments currently markets a digital data recorder, developed under an Army SBIR program. H & N Instruments has also sold custom instrumentation to a variety of industrial clients.

H & N Instruments is beginning a related Phase I SBIR investigation for the Army to develop receptor mimitopes from combinatorial arrays.

*Implementation Strategy*

At the end of the Phase II investigation H & N Instruments will have a prototype facility with the capability to produce reasonably sized immobilized arrays, containing up to a few hundred thousand different biomolecules. We seek joint venture partners to help us develop diagnostic methods using these arrays. We envision creating customized arrays for evaluation by the partner; the partner's expertise in the marketplace requirements for diagnostic products will guide in the selection of the analytes and the criteria for success. A larger facility will ultimately be built, for the manufacture of larger diagnostic arrays.

**HEM Data Corporation**  
17336 12 Mile Road  
Southfield, Michigan 48076  
Phone: (810) 559-5607  
Fax: (810) 559-8008  
Contact: Richard P. Walter

**Technology Category:** PC-based software, Data Acquisition

*Company Description*

HEM Data's goal is to be the premier software developer and marketer of PC-based data acquisition, display and analysis software. We want to be able to handle all types of engineering and scientific data.

*Project Abstract*

The Phase I SBIR award and a Michigan State Research Fund award funded the development of a non-invasive technique to detect arteriosclerosis in its early stages. The proposed product was called the "Artery Analyzer." Since it was required that we have a low cost yet powerful solution that combined the functionality of a digital storage oscilloscope, data acquisition system, strip chart recorder, function generator, filter, and spectrum analyzer, an IBM PC was used to acquire and analyze the data.

Upon the urging of our biomedical and engineering consultants, HEM Data decided that the PC-based software was a better product than the originally planned Artery Analyzer. The major reasons for the project shift was that it was very difficult to prove the Artery Analyzer worked correctly as a non-invasive technique, and secondly, the market for the PC software, called Snapshot Storage Scope<sup>TM</sup>, not only served the biomedical community but also any scientist and engineer requiring data acquisition.

HEM Data then proceeded to obtain two more grants from the State of Michigan's Research Fund (HEM's three is the highest number ever awarded to any company) to further develop the data acquisition and analysis software. HEM Data first released Snapshot as a commercial PC-based software product in 1986. This grew to a family of 9 products with world-wide sales. In 1991 HEM Data introduced Snap-Master<sup>TM</sup>, the first data acquisition and analysis software to take full advantage of Microsoft<sup>®</sup> Windows<sup>TM</sup> V3.0. HEM Data is now about to release Version 3.0 of Snap-Master in June 1994.

*Other Technical Capabilities*

HEM Data is primarily a software developer, manufacturer, and marketing company for our software. Our software is sold world-wide primarily through the input/output (I/O) hardware manufacturers (12 to date) who have hardware that is compatible with our software. The I/O hardware contains A/D, D/A, digital I/O

and signal conditioning. HEM Data also resells compatible hardware and does system integration work.

#### *Implementation Strategy*

HEM Data is seeking strategic alliances for two reasons. One, even though we believe we have the best products in our market and have the stamp of approval of our I/O hardware allies, we are still relatively unknown. Consequently, the potential for rapid substantial sales increases are high. HEM does not want to seek close alliances with one hardware vendor and lose the support of the other I/O vendors.

Second, HEM Data's products are generic, horizontally marketed products. Snap-Master for Windows lends itself to be adapted to specific vertical applications. The "cake" is made, all we have to do now is decorate it a little for specific applications. Companies in these vertical markets make good allies and are primary candidates for a strategic partner. The acronym HEM represents both Hydraulics, Electrical, Mechanical and HEModynamics., reflecting our experience. Target markets include the automotive, aerospace, biomedical, industrial/factory industries.

#### **Innovation Associates, Inc.**

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Contact Person:

Judith L. Erb, Director Bio-Sensors

Email: [erb@sphinx.biosci.wayne.edu](mailto:erb@sphinx.biosci.wayne.edu)

Technology Category: Biotechnology

#### *Company Purpose*

Innovation Associates' purpose is to develop technology based new products in the areas of Biotechnology and Materials Engineering which have significant commercial and societal value. In the near term our principal goal is to complete the development and commercialization of a unique fiber optic sensor which measures lead in blood at concentrations of clinical interest.

#### *Project Abstract*

During a NIH Phase I SBIR project, Innovation Associates demonstrated the feasibility of developing an instrument for measuring lead concentrations in blood utilizing a fiber optic instrument based on ionophore membrane technology. The lead concentration in a region surrounding an optical fiber is determined by measuring the fluorescence emitted by chromionophores attached to the fiber surface.

An instrument breadboard reliably detected lead at concentrations of 0.6 micro g/dL ( $3 \times 10^{-8}$  M) with a response time of 3 minutes. At the current level of concern for the lead concentration in blood, 10 micro g/dL, the instrument's measurement uncertainty is 10%. The maximum concentration for the linear response region is 200 micro g/dL. The sensor is selective for lead over all other positive ions naturally occurring in blood by a factor 1000. The sensor's performance is unaffected by the natural fluorescence of serum and plasma because it detects ble blood lead screenings, leading to significant cost reductions over present techniques.

Two additional phases are required for commercialization. The Phase II effort will build a first order prototype instrument suitable for determining The basic fiber optic sensor technology used in lead testing is also being applied to developing instruments for identifying the fertile period by measuring urinary estrone-3-glucuronide and pregnanediol glucuronide (NIH Phase II project) and for measuring changes in reproductive hormones in postmenopausal women (NIH Phase I project). Theses efforts are supported by personnel with expertise in biochemistry, synthetic chemistry, assay house chemistry, biosensor, materials, and optics laboratories and PC and workstation based computational capabilities.

#### *Implementation Strategy*

At this stage, Innovation Associates' preference is to proceed by joint venturing. It is our goal to partner with an organization who has extensive experience in the clinical diagnostic and/or the biosensor market. The specifics on preferable licensing arrangements and/or company affiliations have yet to be decided.

#### **Knusaga Corporation**

3578 S. Van Dyke  
Almont, MI 48003  
(810) 798-2402  
Fax (313) 961-0237  
Contact:

James G. Musser, President  
Frank H. Walker, Hydraulic Wheel Project Manager

Automotive Supplier - Developer and Manufacturer of automotive products and technologies.

Primary R&D technology category - Development of Hydraulic wheel unit (pump/motor) for regenerative braking.

Current major manufactured products - Automotive seats.

#### *Project Abstract - Hydraulic Regenerative Braking*

Academia has long touted the principal of regenerative braking for automobiles as a possible method of significantly reducing automotive fuel consumption. Regenerative braking is the capturing and storage of energy during the deceleration

mode of a vehicle and the reapplication of a large portion (potentially more than 60%) of that energy during the subsequent acceleration. The three leading contenders for energy storage in an automotive vehicle are: mechanical (flywheel), electrical (battery), and hydraulic (accumulator). Currently, in the EPA urban cycle, between 40% and 50% of the energy which reaches the drive wheels ends up as heat in the friction brakes without regenerative braking.

Knusaga Corporation has developed a hydraulic wheel unit which can serve as the "muscle" for a hydraulic regenerative system. The device can locate inside each wheel of the vehicle, utilizing the space just outboard of the brake rotor which has been defined for the brake caliper, but in the three quadrants not utilized by the caliper. (Typically, a disc brake caliper utilizes about one-fourth of the circle, or one quadrant, leaving the other three quadrants vacant.)

The hydraulic wheel is limited to operating speeds below approximately 70 km/h, above which it is completely disengaged. Being a radial piston device, it is easily disengaged when not required, with only the slight drag of low pressure seals in operation during the disengaged mode. Although fluid power has limitations of speed and efficiency, it provides a very compact method of transferring energy: in this application more than six kilowatts of power intermittently at approximately eight and one half kilograms mass per wheel unit.

By using two or four wheels as pumps to charge a high pressure hydraulic accumulator during deceleration, the kinetic energy of the vehicle is converted to potential energy. The compressed nitrogen gas in the accumulator acts as a spring opposing the fluid which has been pumped into the accumulator. During the next acceleration of the vehicle, the high pressure fluid is released from the accumulator and fed to the hydraulic wheel units which now act as hydraulic motors to assist in returning the vehicle back to its previous speed. Because the recovered energy from a regenerative system helps accelerate a vehicle from a standing start, the resulting performance gain can be traded for additional fuel economy gain by reducing the engine displacement in the vehicle and/or altering the final drive ratios. Computer modeling has shown a minimum 25% EPA urban fuel economy gain and 20% EPA composite fuel economy gain without degrading performance or downsizing the vehicle.

#### *Implementation Strategy*

Knusaga Corporation will entertain joint ventures to complete the development of the necessary controls and interfaces required to complete a demonstrator hydraulic regenerative braking vehicle. Knusaga Corporation is prepared to manufacture and/or license the manufacture of all parts, assemblies, and controls necessary to accomplish hydraulic braking at the ultimate required demand volumes.

**Mandala Sciences Inc.**  
4089 Aberdeen Court  
Orchard Lake, MI 48323  
Phone: (810) 737-0558  
Fax: (810) 737-0558  
Email: emf@mscn.com

Mark Schwartz, President

**Technology Categories:** Medical Technology/Instrumentation  
Communications/Information

*Company Purpose and Goals*

Mandala Sciences Inc. (MSI) researches and develops software programs and computer systems to automate or assist in the analysis of complex information. MSI works in areas of advanced technology and solicits problems intractable by conventional computer techniques. In particular, MSI has been concentrating on development of computer systems to improve medical diagnostic capabilities. Customers for these products will be hospitals, doctors, and dentists who want practical software that will accomplish useful tasks with as little expenditure of time and money as possible.

*Project Abstract*

In this Phase I project, MSI is researching methods which will enhance and automate the quantitative measurements used in arriving at the bone age interpretation. In particular, neural networks (NN) and image analysis methods will be applied to automatic determination of bone aging. Determination of bone age or skeletal maturity is a valuable tool used by Pediatricians and Pediatric image noise, low contrast levels, and superimposition of features.

*Other Corporate Capabilities*

Many of the concepts encompassing MSI technologies have been state-of-the-art research by a founding partner for over fifteen years. Therefore, significant development has already been completed in design and development of proprietary image processing, pattern recognition, and neural network software systems. This gives MSI a headstart in algorithm development or systems design which can be applied to any customer's problem or specification. In addition, MSI customers typically desire practical software that will accomplish well defined tasks with as little expenditure of time and money as possible. Our personnel's ability to deliver such solutions has led to successful work on projects as varied as medical instrument diagnostics, robot guidance, software for naval vessel location, medical outcomes database analysis, and dental x-ray image processing.

*Implementation Strategy*

Mandala Sciences seeks joint ventures and teaming partnerships with:

**MEDICAL INSTRUMENTATION MANUFACTURERS** for development of systems for improved interpretation of patient data resulting in physician's aids for automated diagnosis. MSI also has expertise in development of model-based expert systems for assisted diagnosis of instrumentation failures.

**AUTOMOBILE INDUSTRY MANUFACTURERS** for development of more powerful terrain and traffic environment sensors. MSI personnel have recently worked on a number of advanced algorithms including those regarding assistance of drivers with vehicle guidance.

**DEFENSE CONTRACTORS** for development of improved techniques for automating target recognition. MSI personnel have produced research results with type problems.

**RESEARCH SCIENTISTS** for development of specialized data acquisition software and hardware. MSI is very proficient in design of laboratory experiment automation using the LabView software from National Instruments.

**VISUAL DATABASE USERS** for collaboration on solutions to problems involving image analysis, pattern recognition, computer vision, and multi-media database organization.

**MARELCO Power Systems, Inc.**

317 Catrell Drive  
Howell, MI 48843  
Phone 517-546-6330  
Fax 517-546-9565

Contact Persons:

Mr. Peter H. Burgher, President  
Mr. David N. Ratliff, V.P. Engineering

*Company purpose and goals:*

MARELCO's purpose is to identify and develop marketable technology related to the power magnetics industry. Mainly: research and development is applied to transformer, inductor, power supplies and associated power systems.

MARELCO's goal is to develop these technologies which will fit our customers requirements. MARELCO always tries to identify customer requirements which parallel the research and development technology.

*Project Abstract*

MARELCO is currently in the process of applying for SBIR funding for the development of an Electric Vehicle Charging System. MARELCO has previously

received State Research funding for two separate projects 1992, 1993 respectively. These Grants were used to develop technology related to Harmonic Filtering for the Power Factor Correction industry.

*Other Corporate Technical Capabilities*

MARELCO has over 30 years of magnetic design experience and utilizes computer aided engineering. MARELCO also has strong alliances with Michigan State University and the University of Michigan. MARELCO utilizes these two centers of excellence whenever possible in correlation with R & D projects.

*Implementation Strategy*

MARELCO is currently seeking a charging control designer to work with on the Electric Vehicle Charging System project. MARELCO would be happy to discuss our thoughts on this topic with any individual of firm which has extensive experience in this field.

**Materials Sciences Corporation**

500 Office Center Drive

Suite 250

Fort Washington, PA 19034

Tel: 215-542-8400

Fax: 215-542-8401

E-Mail: [cassin@bwr.com](mailto:cassin@bwr.com)

Contact: Tom Cassin

*Company Purpose and Goals*

The Materials Sciences Corporation (MSC) is an engineering services organization providing advanced technology for the structures and structural performance, and are particularly well known for expertise in the field of composite materials.

*Project Abstract*

A novel material concept for thermal management has been fabricated and demonstrated. The patented MSC material concept offers a previously unattainable passive in-plane thermal conductivity of 1000 W/mK and a tailored coefficient of thermal expansion (CTE), while maintaining requisite system design goals including low weight and high stiffness. The key to the MSC concept is to decouple the thermal and mechanical interdependence of the individual constituents that comprise the make-up of the material.

*Corporate Technical Capabilities*

MSC has been involved in many aspects relating to structures and the use of composite materials including analysis, design, research, applications, cost and marketing studies. Programs have been conducted for clients covering a broad range of interests in both government and industry. Many of these programs have drawn upon the potential of two dynamic technologies: scientific and technological



advances in the study of composite materials making it possible to design both the material and the product simultaneously and sophisticated software packages permitting the engineer to design complex structural systems and perform detailed analyses of localized complexities.

*Implementation Goals*

Currently, MSC is open to several different partnership strategies. A separate company, k-Technology Corporation has been formed to concentrate efforts on developing an independent product based company. kTC is currently working on different derivatives of the present technology as applied to thermal management in both high-end as well as commercial electronic systems.

**MedImage, Inc.**  
6276 Jackson Rd.  
Ann Arbor, MI 48103  
313-665-5400  
313-665-4115 FAX  
E-mail: medimage@msen.com  
Contact: Tod Henderstein; Eastern Regional Sales Manager

**Technology Category:** Medical Technology/Instrumentation

*Company Description*

The professionals at MedImage, Inc. are medical imaging processing specialists. Many of them were involved in providing software support and development for Medical Data Systems equipment. In 1985 development began for new image processing workstations for nuclear medicine. Development continues to incorporate new hardware and image processing algorithms. Network interfaces and archival data storage extend system function as a picture, archiving and communications system.

*Project Abstract*

DELTAmanager-A physician report and image management system. DELTAmanager combines our image processing and computer experience with the graphical user interface, database and hardware advantages of Apple's Power Macintosh computers. This new platform allows our software to be extended to CT and MR Radiology equipment. These data are much higher resolution and present unique challenges. There are few workstations in radiology that can offer the capabilities contained in our base system.

*Other Technical Capabilities*

Networking Interfaces to additional medical modalities- CT and MRI. Printing and imaging experience. DELTAmanager was first product to print images with LaserWriter in Nuclear Medicine field. Database expertise includes patient management, report generation and management of archival storage.

#### *Implementation Strategy*

All the major nuclear medicine manufacturers are authorized distributors of the DELTAmanger product. OEM suppliers to Siemens and Picker for display systems. Incorporating DICOM networking technology supplied by Merge Technology, Inc.

#### **Meridian Instruments, Inc.**

2310 Science Parkway

Okemos, MI 48864

Tel: (517)349-7200

Fax: (517)349-5967

e-mail: mas@itrl.bch.msu.edu

Contact: Peter Burrill, Vice President Business Development

**Technology Category:** Medical Technology/Instrumentation

Meridian Instruments, Inc. is a manufacturer of laser scanning confocal microscope systems designed for the biomedical research market.

We are following a strategy of growth through the development of innovative products that will allow us to expand our customer base and penetrate new markets. To that end, we are engaged in the development of the ideal detectors for chromatography.

Time-of-flight mass spectrometry (TOFMS) with time-array detection (TAD) is the ideal technology for chromatographic detection for the following reasons:

1. Data generation exceeds the requirements of the fastest chromatography; spectral acquisition rates of up to 1000 spectra per second are possible compared to up to 10 spectra per second for ion traps and quadrupole mass spectrometers.
2. Sensitivity and S/N for full spectra are potentially orders of magnitude greater than single-ion monitoring.
3. Mass range is unlimited, non-discriminating, and simple to calibrate.
4. The high quality and quantity of data obtained enables higher productivity by reducing chromatographic analysis times by 10 to 100 fold through the patented process - Time-Compressed Chromatography (TM).

Meridian Instruments has developed an engineering prototype TOFMS/TAD instrument for gas chromatography (GC) applications that is capable of producing spectra at rates up to 200 per second or more with sensitivity in the low picogram region. We are currently developing a commercial prototype with enhanced sensitivity and spectral acquisition rates of up to 1000 spectra per second. This instrumentation has wide-ranging applications including real-time process monitoring, process development, ambient air monitoring, high volume analyses and as an elegant detector for fast gas chromatography.

Meridian is looking to develop a strategic alliance with one or more companies to complete the development of the commercial TOFMS/TAD for GC applications and OEM, jointly market or license the technology for use in specified markets. We would also like to find one or more partners who would be interested in the joint development of our technology for liquid chromatography and capillary electrophoresis applications.

**Micro-Optics Technologies, Inc.**

8608 University Green #5

PO Box 620377

Middleton, WI 53562

Phone: (608) 831-0655

FAX: (608) 831-5821

e-mail Internet: 71665.1551@compuserve.com

Contact Person: James Stec, Vice President of Engineering

Technology Category: Communications/Information

Micro-Optics Technologies, Inc. manufactures and markets fiber optic microphones, fiber optic low pressure sensors and liquid crystal light control products for military and civilian markets. The company develops new products based on electro-optic technology that use light for communication and image processing.

A Fiber Optic Microphone (FOM) has been developed under a Air Force Phase II Small Business Innovation Research contract in cooperation with Armstrong Laboratory at Wright-Patterson Air Force Base. A noise canceling model is currently being developed under a NASA Phase I contract.

The fiber optic microphone converts acoustic signals directly to an intensity modulated light signal which is transmitted over fiber optic cables. It can also be used as a low pressure sensor at infrasonic through acoustic frequencies. This microphone is immune kilometers away from where the microphone is being used with no degradation of the signal. Several different FOMs can be multiplexed over the same fiber optic trunk line offering space and weight savings over copper.

Micro-Optics Technologies intends to manufacture and market fiber optic microphones and low pressure acoustic sensors to military and commercial markets. The company is also currently selling liquid crystal spatial light modulators, attenuators and polarization control devices.

The expertise of the individuals in the company lies in the area of electro-optic technology. We are looking for individuals or companies who could contribute knowledge and funding in the acoustic development of the fiber optic microphone and sensors and use already established distribution channels to market the above products. Any relationship would include cooperative efforts to identify areas

where the products currently held by Micro-optics Technology could be utilized. We also intend for this cooperation to extend to the identification and development of needed products based on this technology.

**Microcide, Inc.**

2209 Niagara Drive, Troy, MI 48083-5933

Tel (313) 965-0516

Fax (313) 963-7606

Contact: John A. Lopes, Ph.D.

Technology Category: Biotechnology

*Company Description:*

Microcide, Inc., is a biotechnology company incorporated in 1990. The primary objective of the business is to develop new safe and nontoxic microbicidal products for public health, personal care, food, agriculture, veterinary and environmental purposes. The company also offers contract research and testing services related to microbiology and chemistry in such disciplines as food, dairy, water, environment and public health.

The corporation has planned activities in three main categories. 1. Research and development of new microbicidal products, 2. Contractual research for various government and private agencies, and 3. Services to perform microbiological and chemical tests. As planned the corporation has demonstrated capabilities of performance in these areas by product development and winning a SBIR grant.

*Project Abstract:*

Background: Food safety is a major concern in both public health and food industries. Raw food products are either derived from animals or plants and get contaminated with pathogenic and spoilage microorganisms at the source, in the environment or subsequently during handling and processing. Presently available disinfectants/sanitizers belong to one of the following chemical categories: (1) halogens, (2) aldehydes, (3) quaternary ammonium compounds, (4) acid anionic surfactants, and (5) peroxygen compounds. Except for acid anionic surfactant category, all types of disinfectants either covalently react with organic materials in food products to produce carcinogenic compounds or leave undesirable residue in treated foods. Chlorine based sanitizers can covalently react with organic materials to produce carcinogenic compounds. Iodine residue is not desirable in foods for certain individuals with thyroid problems. Aldehydes such as formaldehyde and glutaraldehyde also covalently react with food ingredients and are undesirable because of their carcinogenic properties. Quaternary compounds can strongly bind to raw food ingredients and leave substantial amount of residue. Residue from hydrogen peroxide based sanitizers may have carcinogenic potential. Acid anionic disinfectants used for plant sanitation cannot be used for disinfection of food because the ingredients do not meet safety requirement as food additives. Microcide has developed products based on anionic surface active agents with

ingredients that can be classified as either food additive or GRAS as defined by the U.S. FDA.

*Products:*

During SBIR Phase I, Microcide has developed and evaluated safe and nontoxic sanitizers that can be used for personal care as well as for disinfection of raw food. Microcide has developed a new mouthwash for personal care and three new sanitizing products for treating raw food. The mouthwash exhibits powerful microbicidal activities against oral pathogens and is ready to be marketed as either powder or liquid. The powder can be readily mixed with tap water to make shelfstable liquid mouthwash. The food sanitizers have been developed in concentrated powder or liquid form. The sanitizers show broad spectrum of bactericidal activity against both gram positive and gram negative bacteria that include important food-borne pathogens. The sanitizers have been evaluated for their efficacy to reduce microbial population on fresh vegetables. The sanitizers have also demonstrated lethal activities against *Mycobacterium tuberculosis*, yeasts and protozoal cysts of *Giardia* and *Ameba*.

*Commercial Opportunities:*

These products have been protected by US patents and international patents are pending. In both food as well as health care industries there is market potential for these products could run in several hundreds of millions of dollars. The basic technology can also be used for developing a broad range of products for total body disinfection, hand disinfection and for other personal care products both for institutional use in hospitals, nursing homes as well as for personal use. Their activity against broad spectrum of microorganisms combined with safety, shelf stability, low cost, biodegradability, freedom from organoleptic properties make them the choice sanitizing and disinfecting agents for food, health care and agricultural industries. Microcide is ready to form joint venture/partnership or license these technology for commercialization.

**Mission Research Corporation**

7907 Ostrow Street, Ste. D

San Diego, CA 92111

Phone: (619) 560 5351 x 103

Fax: (619) 560 7352

Contact: Wilf Eggington, Director Aircraft & Marine Systems

Technology Category: Transport

*Company Description:*

Mission Research Corporation (MRC) was established in July 1970 for the purpose of developing a broad based and highly competent scientific organization to perform applied research on significant problems. This goal has been maintained over the years through slow but steady growth, effective cost control, and uncompromising attention to quality.

*Project Abstract:*

Under USAF and DOE sponsorship MRC has performed the initial development of a hybrid aircraft, termed cyclocraft, that combines aerostatic and aerodynamic lift. The cyclocraft offers low acquisition and operating costs, endurance measured in days, payloads of several tons, VTOL and ability to operate from unprepared surfaces.

The major application categories are (i) small unmanned cyclocraft for communication link and surveillance work, and (ii) large heavy-lift aircraft, operating in areas lacking large transport infrastructure. Many specific applications have been identified by MRC and significant interest has been shown by several end-users. For example, cyclocraft offer significant advantages over other systems for aerial logging, oil and gas operations in wetlands and intra-theater transport.

MRC has developed cyclocraft analytical, empirical and correlated data. The company has demonstrated its operational characteristics and developed a computer-based design model that can rapidly size cyclocraft to meet specific operational needs. MRC has utilized the latter to optimize cyclocraft designs for several applications. Detailed reports on the work accomplished are available.

*Other Technical Capabilities:*

MRC is comprised of over 300 scientific and support personnel performing a broad range of research efforts. The firm has responded to meet the growing needs of industry and government for high quality analytical, theoretical, and experimental support in nuclear weapons effects, directed energy, physical security, RF and radar signal propagation and interaction, signal processing, system performance, and system design and evaluation.

MRC is an independent organization having no manufacturing, proprietary interests, or contractual relationships that could compromise its objectivity or dedication to its clients' interest. MRC is a small business under Standards Industrial Code 8731, Commercial Physical and Biological Research. MRC was recently selected as Small Business Subcontractor of the Year by the SBA. In addition to its Santa Barbara, California headquarters, MRC has facilities at seventeen other locations and it maintains first-rate scientific computing facilities. Many of the MRC locations are equipped with modern facilities for performing experimental work.

*Implementation Strategy:*

The next logical step in cyclocraft development is the design, manufacture and operational demonstration of a small prototype aircraft that would have operational utility and provide a basis for the development of other platforms. Such a cyclocraft could provide surveillance of environmentally-sensitive areas, could be operated unmanned for several commercial and DOD missions and could be the forerunner of large heavy-lift cyclocraft.

MRC is seeking a business partner that can provide the resources necessary to exploit the full potential of the cyclocraft and help identify opportunities for further US Government participation. MRC is open to any reasonable offer from a large company; MRC's contribution would be the large cyclocraft technology base and the personnel that can apply it.

**Robert Morgan & Company, Inc.**

271 Helmer Rd. North

Battle Creek, MI 49015

Tel: (616) 962-5592

Fax: (616) 969-0905

Contact:

Robert Morgan, President

Mike Walker, Project Leader

*Company Purpose and Goals*

Robert Morgan & Company, Inc. (RMC) was started in 1988 to provide reliable, cost-effective engineering solutions to complex technical problems facing its customers. The company specializes in new product and process development, and in the design of special machines. The company also provides comprehensive support in the area of quality improvement, statistical process control, design of experiments, and process/product optimization and design for manufacturability.

*Project Abstract*

While working with a Fortune 100 client, a problem relating to waste plastic challenged our team of engineers to develop a problem that has evolved over the past 4 years to form the core of our business. RMC engineers worked with the Department of Engineering, Western Michigan University, to develop an improved process for recycling mixed waste stream plastics and converting them into useful composite polymer materials. The process utilizes existing technologies in new ways, combined with advanced statistical techniques, to deliver valuable composites and innovative polymer alloys with exceptional engineering qualities.

In June 1992 the company won an SBIR Phase I research grant from the EPA to determine the suitability of composite materials obtained by the RMC developed process for use as automotive components. Thirty five unique new polymer materials were made from mostly waste constituents. Twenty one of these materials were compared to fifteen polymer materials used in the automotive industry. Results indicated many of the recycled test materials were capable of meeting basic auto industry specifications for tensile strength, tensile modulus, izod impact, flexural strength, flexural modulus and heat deflection temperature. The favorable results of the Phase I project proved the technology had the potential to dramatically expand the markets and economic value of waste stream plastics. Contacts with potential customers during Phase I work revealed market niches additionally in materials handling products, furniture components, construction and greenhouse components.

The company was awarded a Phase II grant to develop and construct a prototype manufacturing line to make "full size" products. Substantially larger equipment than was used in Phase I was required to process the amount of material and manufacture full size prototype utilizes a similar formulation and processing strategy.

As a consequence of the Phase II grant, a new spin-off company, Polycytek of Michigan, Inc., has been started to carry out the commercialization of the waste plastics conversion technology. The construction of a large scale manufacturing plant is under way in Battle Creek, Michigan. The plant will initially produce materials handling products for the automotive market sector. Complete commercialization, production expansion, and a national network of authorized resellers will be in place by September 1994. This facility will have the capacity to convert approximately 12 million pounds of waste and low value plastics into engineered products annually.

#### *Future Areas of Opportunity*

The polymer alloys and plastics matrix composites developed through the SBIR program have the potential to begin a new type of plastics processing industry. An industry which uses waste plastics not because they represent a social problem, but because they are the raw materials resource of choice.

We seek marketing partners that have specific products they currently sell or are developing that could benefit from 100% recycled content, either as a marketing tool or from a performance standpoint.

#### **Multi-Task Computer Graphics**

280 Getzville Road

Snyder, NY 14226

Phone: 716-838-5907

EMS: INTERNET / MCI ID: 376-5414

MBX: NJOHNSON@ubvms.cc.buffalo.edu

Contact: Noreen Johnson, President

Technology Category: Medical Technology/Instrumentation

#### *Company Description:*

Multi-Task Computer Graphics performs technical analyses and studies and participates in the design, development, and implementation of computer graphics systems for educational, scientific, medical and military software systems.

#### **Project Abstract:**

A three-dimensional (3-D) computer graphics model, GROW3D, has been created to predict and to visualize human skull growth, focusing on the mandible for the prototype system. A parameterized, 3-D computer graphics model, based upon computer tomography (CT) spatial data of the human mandible is



metamorphosed by the growth algorithms (based upon morphological data and statistical growth data) into a new shape and size appropriate for an infant, an adolescent or an adult. Unique in not only providing a 3-D visualization of the age-simulated mandible, but in simulating mandible aging for a specific individual, this tool takes growth forecasting beyond the current realm of 2-D cephalogram superimposition analysis into 3-D visualization extrapolated through time.

*Benefits/Application:*

A predictive, 3-D skull bone growth visualization model has great potential as a diagnostic tool for craniofacial researchers and clinicians. Merged with extensive statistical knowledge, the bounty and accuracy of CT data is tapped by this model. The operator is free to rotate and observe a computer-generated 3-D visualization of predicted growth rather than be burdened by struggling to picture in his mind's eye what the growth would be from the displacement of points and lines in consecutive 2-D cephalograms.

The initial commercial application of this model addresses the needs of medical diagnosis/treatment planning, but ultimate commercial applications range over medical training, anthropological variation comparison, pathological studies, developmental analysis, paleontological categorization, forensic kidnap victim aging---any endeavor which can utilize a window on an anthropometric database which varies with individual and with time.

*Development Needed:*

Feasibility has been established, but research remains to be done to implement the concept. The more readily available Magnetic Resonance Imaging data should be looked into as the source of the 3-D data used for the growth visualization model. Comparability of the acquired 3-D data with the 2-D cephalogram normative longitudinal databases must be established. More sophisticated algorithms to improve simulated 3-D surface coherence must be developed. Rigorous testing against actual documented growth must be carried out. Beyond this primal development to establish the tool, future product development would include expansion of the tool to other skull bones, development of growth manipulation tools, and extension to an interactive environment.

*Other Technical Capabilities:*

Computer Graphics Simulation, Scientific Visualization

*Implementation Strategy:*

Multi-Task Computer Graphics intends to pursue the research of this concept in a Phase II proposal with the National Institutes of Health SBIR program. Ultimate commercialization of the concept involves collaboration with a company whose product would be enhanced by graphical simulation, novel to so many acquisition and imaging systems. Multi-Task Computer Graphics is open to commercialization ideas that may be provided by various business structures (joint ventures, partnerships and strategic alliances, among others).

Nienhaus & Associates, Inc.  
201 Creekview Drive  
Greenfield, IN 46140  
(317) 462-5805 voice/fax  
e-mail: 72466,733@compuserve.com  
Contact: Thomas G. Nienhaus, Jr.

Category: Communication/Information

*Company Goals*

Pursue growth by helping customers meet their goals with innovative technology and support mechanisms.

*Abstract Phase I SBIR: Distributed Mission Planning*

Traditional project management relies on hierarchically structured projects. As organizations decentralize, the need for distributed planning increases concomitant with a greater need for communication. Operations planning through distributed simulation has been shown to be an appropriate means of organizational role playing. Embedded within the simulation model are hybrid models using artificial intelligence algorithms for decision making by objects within model.

*Potential commercial applications:*

On-line project management forecasting, "Wargaming for the Boardroom," Resource and project management, The benefits of on-line forecasting of changes to schedule exposure, resource utilization, and project cost and schedule performance.

Phase 2 plans are to move the research into a full scale product development removing artificial limitations of the Phase I effort, with added quality assurance. The product introduction would be completed through the generation of test plans, user and technical documentation, training, marketing and sales materials. Phase 3 plans are to expand the sales effort based on successful test sites.

*Technical Capabilities:*

NeXTSTEP Developers, Artificial Intelligence, Systems Engineering

*Implementation Strategy*

Identify an industrial 'piggyback test site' to serve as a success model. This site should fit our customer's profile, and be willing to invest manpower to assist in the local implementation in exchange for a fixed number of free seat licenses.

Marketing and technical alliances sought with computer hardware and database vendors. Marketing and sales alliances sought with major system integrators.

**North Coast Innovation, Inc..**

8001 Sweet Valley Drive

Cleveland, OH 44125

phone (216) 642-5644

fax (216) 642-1928

Contact: L. Scot Duncan, President

Technology Category: Materials

*Company Purpose/Goals:*

North Coast Innovation develops, commercializes and licenses new products and processes based on innovative mechanical and thermal technologies.

*Abstract:*

US Army SBIR #A91-166 (phase I) - THERMOPLASTIC MATRIX IMPREGNATION - A unique process for in-line impregnation of glass fiber tows (multi-fiber continuous strands) with thermoplastic resins was demonstrated. Our current interest is to apply this technology to the production of directionally reinforced "plastic lumber" made from recycled thermoplastic resins.

US Navy SBIR #N91-010 (phase I) - LITHIUM RECOVERY SYSTEM - A thermo-mechanical process concept for separating and recovering molten lithium from lithium salts was developed. While the original application was related to torpedo systems, the technology may have other applications in the separation of materials in various recycling and materials recovery processes.

*Other Capabilities:*

North Coast Innovation does development work in a wide range of electromechanical and thermal processes. Typical contract assignments include: Feasibility Assessments; Product and Process Development; Manufacturing Process Planning; Materials Handling Studies; Productivity Improvement Studies.

*Implementation Strategy*

North Coast Innovation is seeking a joint development relationship with a converter/recycler to explore and develop proprietary applications of our SBIR technologies including: continuous glass fiber reinforced recycled thermoplastics, and molten metal/metal salt separation and recovery.

**Nova Scientific Corporation**  
(dba - Nova Technology, Inc.)  
23901 Calabasas Road, Suite 1001  
Calabasas, CA 91302  
Phone: (818) 222-9400  
Fax: (818) 222-9988  
Contact: Don Bernheisel, President

Technical Category: Human Performance Measurement Technology

*Company purpose and goals:*

Nova Technology, Inc. is engaged in the research and development of human performance measurement technology using computerized tests. Its scientists have over 80 years of experience in the fields of clinical and experimental psychology and have provided government and industry with high quality research in these areas. Using the results of some of this research, the company has developed a performance testing product called NovaScan (U.S. patented) and plans to be a major source of this technology to government and private industry organizations.

*Project abstract:*

The company, using the results of an SBIR Phase I research project has developed NovaScan. NovaScan's, performance-based test, is a self administered, computer-generated, precise measurement of job-relevant cognitive and psychomotor skills which detects an employee's inability to perform at normal job-skill levels due to impairment from drugs, alcohol, fatigue, illness, prescription and over-the-counter medicine or other "stressors."

NovaScan may serve as an alternative to invasive biochemical drug and alcohol testing and may be used to ensure the safety of the employee, the work place and the general public.

NovaScan provides the following unique combination of testing characteristics:

- Customization to specific job categories
- Strong theoretical foundation
- Use of employee's own baseline
- Self-administered four-minute test, supervisor controlled
- Well-validated array of tests
- Automated analysis and administrative system
- Clinical follow-up recommendations

NovaScan requires an IBM PC or compatible computer with a 286 or faster processor, one MB of memory, a VGA graphics adapter (black and white or color monitor), and any size hard disk. In addition, the company supplies a special response unit and custom software for taking the test.

NovaScan's chief benefit is to improve the level of safety in the workplace by identifying individuals, before they start a work shift, who may be impaired due to illicit or prescription drugs, alcohol, fatigue, illness or stress.

*Other corporate technical capabilities:*

All of NovaScan's development was accomplished with full time employees of the company. This includes the basic scientific design and validation, test programming and administrative system design and database programming. The company holds a U.S. patent on NovaScan.

*Implementation strategy:*

The company needs the financial and marketing resources of a larger company to effectively penetrate the very large market for NovaScan. The details of the relationship between the companies would depend upon the strengths of the other company.

NovaScan is a relatively mature product and is installed at a major ship repair yard. In addition, it has been selected by the FAA for trial implementation and will fly on the Space Shuttle on July 6, 1994 to test for the effects of microgravity on astronauts.

**Omega International Technology**

460 Wegner Road

Lakemoor (McHenry), IL 60050-8653

Phone 815-344-5455

Fax 815-344-3336

Contact: Dr. Nand Gupta

*Company Description:*

Omega International Technology, founded in 1987, is a small high technology R/D and manufacturing company. SBA has certified Omega as a Small Disadvantage Business under section 8(a). Since its inception, Omega has developed a large x-ray systems using Linear Array of Solid State x-ray Detectors for NDE. Omega has had many R/D as well as manufacturing contracts with Navy, USDA, medical and industrial manufacturers. Recently, Omega has installed a x-ray based Fuel Gap Measurement System at a Commercial Nuclear Fuel Manufacturing plant.

Omega is headed by its founder, Dr. Nand Gupta who received his Ph.D. in Nuclear Physics in 1969 from the University of Massachusetts. Since then he has been involved with the research, manufacturing and application of nuclear detectors for Alpha, Beta, Gamma and X-rays. Additionally, for the last 16 years Dr. Gupta has been involved with the design of x-ray CT scanners and other Digital Radiographic systems for medical and Non-Destructive Evaluation (NDE). Dr. Nand Gupta is one of the few leading scientists in the world in the field of

diagnostic imaging instrumentation development. During the past 25 years, Dr. Gupta has published many scientific and technical articles in radiation detection and instrumentation.

*Phase I SBIR: Foreign Material Detection System For Food Items*  
Topic: Biotech

The goal of the Foreign Material Detection System for Foreign Items research project is to develop an on-line Foreign Object detection system for raw, in-process and packaged food products using a low energy x-ray source and a solid state x-ray detector array. During the phase I project, Omega has fabricated a Concept Prototype system with a 80 channel solid state detector array and a low energy x-ray source. Omega has experimented with this Concept Prototype and several types of packaged food products with good success in detecting small pieces of steel, glass, rocks and bones in lunch meat and ice cream packages.

*Phase II SBIR: Digital Tangential Scanner For Loaded Rocket Motors*  
Topic: Materials

The goal of the Digital Tangential Scanner For Loaded Rocket Motors research project is to develop a high speed, semi-automated, x-ray rocket motor inspection system. We have optimized and arrived at a prototype x-ray tangential scanning system which uses a very low noise x-ray solid state linear detector array. The signal-to-noise ratio from such detector system is as high as 1,000,000 to 1 compared to only a hundred to one for real time or film radiography systems. Hence the tangential scanning system using solid state linear detector array can detect very small flaws in the rocket motors. The tangential scanner requires less than 10 minutes of data collection for a 10" long rocket motor section. The computer system of the scanner can also analyze the data simultaneous to the data collection. Hence at the end of the scan of a motor, the raw data as well as analyzed data can be available to the operator for decision.

*Other Technical Capabilities:*

Omega has also provided technology for a high density solid state x-ray detector array for advance bone density measurement system and has also supported development of solid state and xenon ionization detector arrays for medical x-ray CT scanner. At present, Omega is completing the design and manufacturer of an x-ray inspection system for rocket motors and missiles under a contract from Navy. This system uses a Linear Array of Solid State Detectors developed by Omega. We are also working on solving problems in nuclear fuel systems to measure enrichment and other concentration levels in fuel pellets at production speed.

*Implementation Strategy:*

Omega is seeking relationships with companies that have a need for our technology either as a user or as a manufacturer. The relationship can be customer/vendor, teaming/partner or other mutually beneficial affiliation. We have

work with organizations such as B&W Nuclear Fuel and Oscar Meyer in both capacities.

**OPTRAND, Inc.**

3916 Trade Center Drive  
Ann Arbor, Michigan 48108  
Phone: (313) 971-9712  
Fax: (313) 971-9712

Contact person: Dr. Marek T. Włodarczyk, President

Technology category: Laser/Optics, Transportation, Environment

*Company statement and purpose*

OPTRAND is in the business of developing and manufacturing fiber optic sensors for harsh environment applications. The Company aims at commercializing cost-effective sensors for large commercial markets. Applications of OPTRAND's products include automotive engine and industrial process controls, environmental monitoring, and aerospace applications. OPTRAND is also engaging in transportation, environmental, and aerospace sensor research and development in order to seek licensing and spin-off opportunities.

*Project abstract*

OPTRAND is developing proprietary Fiber Optic Sensor (FOS) systems for hostile environments that avoid problems historically encountered in the development of other sensor technologies. Fiber optic sensors developed by OPTRAND offer world highest temperature-capability (potentially up to 800 °C) and smallest size (down to 2 mm in diameter) for detecting combustion pressure, air-fuel, and NOx concentration.

OPTRAND's pressure sensor, the FiberPSI™, is robust, suitable for automated manufacturing, and cost-effective. It offers low thermal errors and long term reliability, and permits easy sensor integration with a spark plug.

OPTRAND's Air-Fuel and NOx sensor, the LumiTran™, allows real time in-cylinder monitoring of combustion by-products. The Company has a number of proprietary technologies related to a low-cost transceiver package, sensor design, and a compensation technique for the effects of combustion deposits.

The final OPTRAND product, the Combustron™, integrates in one package pressure, air-fuel ratio, and NOx sensors. Optics and electronics are shared between all sensing functions, reducing sensor cost and complexity.

OPTRAND is directing its products to the engine control, monitoring, and diagnostic markets. Due to several new environmental regulations to be implemented within the next five years, a tremendous opportunity exists for new types of sensors able to meet new emission requirements for vehicle and stationary

engines. OPTRAND's FOS systems have the potential to revolutionize engine controls leading to a new generation of less polluting and more efficient engines.

*Other corporate technical capabilities*

Among the strengths that OPTRAND feels are especially relevant to environmentally resilient FOS development are: 1) ability to develop sensitive and reliable sensors capable of operating under extreme temperatures, 2) ability to design proprietary fiber optic sensor interfaces free of environmental effects, 3) ability to develop accurate sensor systems based on low-cost components, suitable for large scale commercial applications, and 4) ability to develop and manufacture proprietary optical components critically needed for cost-effective commercial products.

OPTRAND's core technologies are applicable to several other types of sensors including flow, level, acceleration, and temperature. The Company has been also involved in development of a miniature strain gauge based on Silicon micromachining and fiber optics.

*Implementation strategy*

OPTRAND seeks to develop complementary relationships with other firms to access resources and the knowledge needed for efficient and rapid introduction of new products and penetration of new markets.

OPTRAND is presently searching for a strategic partner who possesses both high volume component manufacturing capabilities as well as fiber optic expertise. Optical couplers and optoelectronic transceivers need to be produced in high volumes and below present costs. High numerical aperture fibers capable of withstanding extreme temperatures are needed for products sought by the Company. Low-cost and robust optical connectors are required before FOS can be adopted for under-hood applications.

**Orbital Research Inc./Cleveland Medical Devices, Inc.**

11000 Cedar Ave. Suite 461  
Cleveland, Ohio 44106-3052  
Phone: (216) 791-6720  
Fax: (216) 229-3236

Contact: Robert N. Schmidt, President

Technology Category: Communications/Information

**Orbital Research Inc.** was established by Robert N. Schmidt P.E. in February, 1991 to conduct contract research for the government and industry. We desire to manufacture and license the following products. Three major technologies are currently being developed.

1. **ORCA\* Controller.** The Orbital Research Control Algorithm is an extended horizon adaptive predictive controller, which is two generations ahead of the



current state-of-the-art. NASA, the National Science foundation, and Orbital Research have committed over \$900,000 developing this technology, which can be used for the control of drug delivery, aircraft and spacecraft, robotics, levitated vehicles, and intelligent vehicle-highway systems. The NASA-Langley Phase II SBIR is using the ORCA Controller to control flutter on a near critical wing in a wind tunnel. Both hardware and software for the controller are being provided by Orbital Research.

2. Recycled Plastics. Orbital Research has developed technology to produce continuous fiber reinforced plastics from recycled milk, soap, and soda bottles. The U.S. Army Corps of Engineers, the U.S. Department of Transportation, and Orbital Research have invested over \$100,000 in this technology. It has numerous applications from construction materials, to vehicular panels. The Phase I SBIR is being funded by the U.S. Army Corps of Engineers Construction Engineering Research Laboratories.

3. Microactuators. Through several contracts with the Defense Advanced Research Agency (formerly DARPA, now ARPA), Orbital Research has developed technology to produce a tight shut-off microvalve. These valves, smaller than a human hair, can be used for spacecraft control, drug delivery, and virtual reality games, to name a few applications. Over \$100,000 has been invested in their development.

Desire to form alliances with manufacturers who are interested in these technologies.

#### Technolgy Category: Medical Technology/Instrumentation

Cleveland Medical Devices Inc. was established by Robert N. Schmidt in April 1991 to conduct contract research for the government and the medical industry. We desire to manufacture and/or license the following products.

1. Foot Force Sensor with Telemetry. A Foot Force Sensor has been developed to provide closed-loop feedback to Functional Electrical Stimulation Systems which allow paraplegics to walk. The wireless system transmits data from the foot to the waist. This work is being performed under a Phase II SBIR from the NIH.

2. Telemetry Link. A Multi-Channel 900 MHz system with 75 KHz bandwidth has been developed to transmit data from up to 350 users in close proximity over ranges up to about 500 meters

3. Force Sensor. A force sensitive sensor has been developed to reduce the hysteresis and time delays which are typically observed from traditional force sensitive resistors. Desire to form alliances with manufacturers who are interested in these technologies.

Desire to form alliances with manufacturers who are interested in these technologies.

**PDC**

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Contact: Peter R. Eiseman, President

The corporate products and services are in the subject of grid/mesh generation and computational simulation. This includes fully automatic hexahedral mesh generation, grid modeling, computational fluid dynamics, and related areas of physical simulation. There are also clear ties to modern CAD from a value added point of view.

There are three software products that germinated under the SBIR program (Phase II's from WL/Eglin AFB, AFOSR, and NASA Lewis). These are grid modeling, GridPro/sb3020, 2D grid generation on personal computers, GridPro/pc2000, and 3D multiblock grid generation with automatic zoning, GridPro/az3000.

The multiblock grid generator with automatic zoning provides a fully automatic means to generate hexahedral grids (brick mesh elements) about a wide variety of complex geometric configurations. This represents a major technology breakthrough and provides a capability that is unavailable elsewhere.

Unlike the prior grid/mesh generators, GridPro/az3000 is both automatic and well structured. Moreover, the grid/mesh quality is in a class of its own. The generated grids are smooth and nearly orthogonal. This quality is maintained even as one goes into an intense boundary clustering. Because of the well ordering of grid points, fluid dynamic solution procedures are more available and are more efficient. Because of the quality, they are more reliable, produce more accurate results, and generally operate faster. In addition, the automation is well set up for design variations since reusable components are available for recurrent use and for parametric style actions (as in modern CAD).

Grid modeling is a new topic and the only product is GridPro/sb3020. The topic can be viewed like an extension of computer aided geometric design (CAGD). In distinction, pointwise distributions are important, the action is volumetric, and there is the concurrent integration of both control point arrays and specified boundaries. In addition, there are a rich supply of tools to model by moving control points to new positions.

PDC sells software licenses, provides software support, and performs consulting services. Alliances, cooperative arrangements and funding are important for market penetration on a global scale as well as in the general growth of our product

lines. Phase III activity can certainly help. NASA, Ford, and General Dynamics are some of our customers.

**Picotronix, Inc.**  
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Fax: (313) 663-5150  
Contact:

Robin F. Risser  
Steve Williamson

**Prismoid Optical**  
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Maple Lake, MN 55358  
Phone (612) 878-1529  
Fax (612) 963-5004

Contact: Richard Vizenor, Eng.  
Technology Category: Laser/Optics- Instrumentation

*Company Description:*

Design and manufacture optical measurement systems. Primarily optical non-contact measurements of machined parts. We also market a line of optical service instruments such as Autocollimators and surface interferometers. We have mechanical and optical design capabilities backed up with a complete optical fabrication and machine shop. In our family business, all are enrolled members of the White Earth Reservation Chippewa tribe. We are in the process of 8a qualification. We would encourage any joint venture projects.

*SBIR, Phase II: "Heads up displays for combat aircraft"*  
*Funding agency is DARPA.*

This project involves the fabrication of helmet visors with special optical components built within the visor thickness. These optical components direct a display source to the eye without interfering (mechanically or optically) with see thru vision. Displays are positioned in out of the way areas around the helmet edge. This Phase II project involves the fabrication of these optical components. Since the optical surfaces are replicated from the surfaces of a "Master Mold", the inherent low cost would be a natural for "Virtual Reality" systems requiring "See thru capability."

**Promega Corporation**  
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Email: PBAYNE@HELIX.PROMEGA.COM  
Contact Person: Peter D. Bayne, Director of Grant Development

Technology Category: Biotechnology

*Statement of Company Purpose and Goals:*

Promega Corporation is an established world leader in applying biochemistry and molecular biology to the development of innovative, high value products. Promega's mission is "to become the most responsive supplier of biological reagents and systems in the worldwide biotechnology research products market."

The biological products developed and manufactured by Promega since 1980 have contributed to the rapid progress in genetic engineering research. Promega's contributions include both the "tools" needed for basic research, and sophisticated, easy-to-use products that utilize biotechnology for many diverse applications. The majority of Promega's customers are highly trained laboratory scientists performing biotechnology research.

Founded in 1978, Promega now employs 373 people, 319 of whom are located at the company's world headquarters in Madison, Wisconsin. A privately held company, Promega has maintained consistent profitability, even while extensively expanding facilities, including construction of a 70,000 square foot research/production facility in 1989. Construction of a new \$19 million biopharmaceutical manufacturing facility, will serve the company's expanding production needs.

*Project Abstract:*

Biologically relevant environmental monitoring can be achieved using the genetic responses of microbes to environment conditions as sensors, particularly the specific and generalized responses to toxicity. The generalized toxicity response may be especially important when prior knowledge of the type of toxin is unavailable. Real-time transduction of the genetic responses is most commonly provided by coupling a gene encoding a bioluminescent protein to the system. However, while this works well under controlled laboratory conditions, the information content of a single luminescent signal generally is insufficient to compensate for the complexity of living systems.

At Promega, a system is proposed based on multiplexing by wavelength to increase the information content of the signal transduction process. Research at Promega has shown that the color of light emitted by beetle luciferases can be controlled by changing less than 1% of their primary structures. This unique

situation should allow incorporation of functionally equivalent but distinguishable signal generators into a single sensor, thus granting internal control of the sensor response.

The product of this work will be a platform design for a signal transduction system to provide reliable and robust performance of microbial sensors. The general and fundamental nature of this design will make it widely portable into different sensor configurations. The multiplexing system has novel and important potential applications in several markets, including "real time" detection of toxins in environmental samples. Advantages of this technology include increased sensitivity, specificity, and the potential to develop tests for defined groups of contaminants in a single biosensor. The biosensor project at Promega is part of a larger research effort to develop the capabilities of beetle luciferases for commercial applications.

Other Corporate Technical/Product Capabilities:

Technologies: Recombinant DNA, Fermentation, Purification/separations, Bioprocess, Cell/tissue culture, Synthesis and Sequencing.

Products: Biological reagents, Human Genome Project

*Implementation Strategy:*

Promega favors formal, well-defined strategic alliances.

**QRDC Inc.**

Box 562

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Contact Person: Ms. Stephanie Carl, Administrative Assistant

Technology Category: Smart Materials, Structures, and Machinery  
Vibration Control  
Fasteners and Smart Fasteners  
Machinery Health Condition Monitoring  
Human Body Vibrations  
Vibration-Based Non-Destructive Testing

The following key words identify QRDC technical capabilities:

Dynamics, Vibrations, Machine Monitoring and Diagnostics, Vibration/Noise Control, Smart Structures / Machinery, Acoustics, Structural Analysis, Numerical Modeling, Finite Element Analysis, Design, Stress/Strain Analysis, Computer Aided Design, Failure Analysis, Measurement, Non-destructive Testing, Computer Simulation.

*Brief Background:*

QRDC, Inc., founded in June of 1990, has brought together a team of highly educated and capable scientists, engineers, and administrators with outstanding academic backgrounds and years of analytical and industrial experience. The company has been providing Mechanical Engineering related research, development, and consulting services in response to the needs of government and commercial industries since it was first established. Our goals are: (1) to contribute to the advancement of basic science/engineering and mechanical related technologies; and (2) to develop QRDC-made products that meet the needs of both the government and commercial industries. Our products will be the outcome of our internally and/or externally funded R&D projects.

*QRDC's SBIR Projects:*

The following SBIR projects that were awarded to QRDC during 1992-94. These projects will result in QRDC-made commercialized products. For more information on a specific project, please feel free to contact our office.

*Project 1*

*Title: Application of Localized Vibration and Smart Materials in Controlling the Dynamic Response of Structures*

*Funding Agency: Advance Research Project Agency (ARPA)*

*Identification: Phase I, R&D-Feasibility Study*

*Status: Completed*

The objective of this project was to conduct a feasibility study on the development of a more efficient and precise smart structures based on smart materials, embedded sensors, and specific vibration phenomena. Shape memory alloys (SMA) and multilayered ceramics (PZT and PMN) are used as the smart material, fiber optics with single laser beam and multilayered ceramics make up the sensors, and modal energy localization (MEL) are the vibration phenomena that confine the vibrations of the structure to a small region. Such a combination results in a huge reduction in the number of sensors and actuators, significant gain in computational speed, and improved accuracy of the control system.

QRDC's unique smart structure concepts have been funded by SBIR-ARPA since 1991. The goal of the QRDC-ARPA smart structure project is to deliver "smart" structures, components, and devices that can be used by both military and commercial industry. The following features make our smart structure technology superior to others.

(1) Smart-By-Design (SBD): Our concept has been to make structures or systems smart at their design stage rather than designing "dumb" structures and then attempting to make them smart after they are designed and put in operation. The latter is costly and sometimes impractical. QRDC's concept is based on the modal energy localization (MEL) phenomenon that has proven to be an effective method to optimize a structure to withstand dynamic loads.

(2) Generic Smart Devices (GSD): QRDC's concept has been to develop smart devices that can be integrated in a wide range of existing structures to better control their vibration, noise, and acoustic responses.

(3) Multi-Tasks Smart Components (MTSC): Our concept has been to make all the existing components and sub-components (such as fasteners) smart in order to avoid or minimize add-on elements to the system. It is known that add-on elements, no matter how small, modify the dynamic behavior of structures. Furthermore, add-on elements also increase the complexity of the vibration response of the structure. QRDC's MTSC concept is being applied to fighter aircraft (F-15 at this time) through a project funded by the U.S. Air Force. The results have been very promising.

(4) Optimized Sensors and Actuators (OSA): Our smart structure technology is based on the optimized number of sensors/actuators located in the critical regions of the system. Such critical regions are identified in our smart design process. At this time, our sensors and actuators are an optimum combination of laser-based optics, PZT and PMN ceramics, and shape memory alloys.

*Project 2*

*Title: A Mathematical Model to Optimize and Predict Service-Free Life of Fasteners*

*Funding Agency: U.S. Air Force (Wright Patterson AFB)*

*Identification: Phase I, R&D-Feasibility Study*

*Status: Completed*

As a result of this Phase I project, an efficient and effective computer model that is capable of incorporating the dynamic characteristics of fasteners, aircraft structures, and the interfaces between them is being developed by QRDC's fastener team. The model will be adaptive, based on the closed-loop dynamic relation between fasteners and the host structure. The receptance method, that makes the model compatible with other computer models, is used to formulate the problem. During the development stage, an F15 aircraft is used for collection of data and verification of results.

One of the main objectives of this project is to incorporate QRDC's MTSC and SBD concepts (see project 1) in aircraft fasteners and expand the technology to other applications. The initial version of the developed computer model will be marketed to aircraft, space, and ship industries. Modified versions of the model will be developed for various applications such as buildings, bridges, automobiles, and frame structures.

*Project 3*

*Title: Application of Localized Vibration and Smart Materials in Controlling the Dynamic Response of Structures*

*Funding Agency: Advance Research Project Agency (ARPA)*

*Identification: Phase II, R&D-Development and Prototype Stage*

*Status: In Progress*

The objective of this Phase II project is to develop various smart devices applicable to both structures and machinery. The smart devices will be based on the proved concepts during Phase I of the project (see project 1). Shape Memory Alloys (SMA) and multi-layer ceramics (PZT and PMN) are used as the smart actuators/sensors and an array of optical sensors with a single light source are utilized as sensors. Modal energy localization (MEL) concept is used to confine the vibrations of the structure to a small region. Such a combination of the smart sensors and actuators and MEL phenomenon will result in a huge reduction in the number of sensors and actuators, significant gain in computational speed, and improved accuracy of the control system.

#### *Project 4*

*Title: A Mathematical Model to Optimize and Predict Service-Free Life of Fasteners*

*Funding Agency: U.S. Air Force (Wright Patterson Air Force Base)*

*Identification: R&D-Follow up Feasibility Study*

*Status: In progress*

An efficient and effective mathematical model which is capable of incorporating the dynamic characteristics of fasteners, aircraft structures, and the interfaces between them is being developed by QRDC fastener team. The objectives of this follow-up project is to verify some of the results generated by the computer model during Phase I (see project 2). Laboratory tests are conducted under controlled environment. The computer model is also extended to include more comprehensive model of the aircraft components. F15 aircraft fasteners are the main focus during this study.

#### *Project 5*

*Title: Smart Devices to Minimize Machinery Failures Due to Misalignment, Imbalance, Resonance, Looseness, and Bearing Vibrations*

*Funding Agency: Advance Research Project Agency (ARPA)*

*Identification: Phase III, Prototype and Product Development*

*Status: Pending*

It is well known that most machinery failures are due to excessive heat and/or vibrations. The proposed smart devices will eliminate the majority of machinery failures that are caused by excessive vibrations due to misalignment, mass imbalance, resonance, looseness, and bearing problems. The development, design, fabrication, and testing of such smart devices based on smart materials such as shape memory alloys and multilayered ceramics are proposed. The smart devices will be inserted in (or attached on) machinery. The devices will be designed to sense the vibrations at the unit and compare them with the defect free signature of the system. After the sensors of the device determine the particular vibration problem, the actuators will be activated to correct the problem. It is predicted that the QRDC's smart devices will remove more than fifty percent of the machinery mechanical failures.

The objective of this Phase III project is to fabricate prototypes of the proposed smart devices. Such smart devices will be designed so that they are applicable to



ground, sea, air, and space systems (both defense and commercial). Because of the proprietary nature of the project, no more details can be provided on this project. Patent in process.

#### *Project 6*

*Title: Novel Ionic Gel-Based Smart Actuators, Devices, and Structures*

*Funding Agency: Advance Research Project Agency (ARPA)*

*Identification: Phase III, Prototype and Product Development*

*Status: Pending*

To achieve the goal of making the present and future structures and machinery "smart", there exists the need for development of new "smart" materials that can be used as sensors and/or actuators in such active systems. The proposed research and development effort is focused on the development and applications of ionic polymeric gels in the field of smart materials, smart structures, and artificial muscles. Ionic polymeric gels are three-dimensional networks of cross-linked macro molecular polyelectrolyte that repeatedly and reversibly swell or shrink by changing their ionic composition or pH. Placing the gels in an electric field, applying a voltage gradient across the gels, or activating direct chemical reactions are three possible ways of changing the ionic composition of gels. Thus ionic polymeric gels are electromechanical in nature and direct electrical and computer control of the expansion and contraction of these gels are feasible. Since they can convert electrical and chemical energy to mechanical energy, they may become of particular importance to defense-related applications in smart materials, structures, and machinery, robotics, and artificial muscles. The goal of this project is to study the feasibility of developing ionic gel-based smart devices and structures. It is predicted that the QRDC's gel-based smart devices will have a significant impact on the U.S. role in this highly competitive field.

Upon successful completion of the first 30 months of the planned efforts, commercial prototypes will be built and extensive field tests will be conducted. In the last 18 months of the project, the objectives will be to have commercial prototypes with proven test results so that the developed products can be brought in both defense and commercial markets. Research and development will continue to find more applications and to improve the designed products. The principal investigators believe that the described developments will significantly enrich the field of adaptive structures and machinery and artificial muscles.

#### *Project 7*

*Title: Optimization and Prediction of Service-Free Life of Aircraft*

*Fasteners-Mathematical Model and Laboratory Testing*

*Funding Agency: U.S. Air Force (Wright Patterson Air Force Base)*

*Identification: Phase II, R&D-Prototype Development*

*Status: Pending*

Because of all the product liability suits and the mounting warranty costs, there is a growing need for more reliable fasteners. Mechanical designers of products ranging from light-weight automobiles to coal-mining equipment, to civil structures, to aircraft, and to space structures are taking a hard look at their bolted

assemblies since the old idea of "playing it safe by over designing the bolted joints" is no longer acceptable. The objective of this project is to develop an efficient and effective computer model which can be used to 1) study the loosening of aircraft fasteners and therefore to gain a better understanding of their loosening effects, 2) to identify those aircraft fasteners that are more prone to lose their grip, and 3) to predict the service-free life of the fasteners so that aircraft can be scheduled for service checks. It is proposed to achieve the above objectives by incorporating the dynamic characteristics of aircraft fasteners, their interfaces with the aircraft, and the aircraft structure in a computer model based on the component-mode syntheses via receptance method. The main innovation of the approach is the inclusion of the effects of fasteners on vibration phenomenon, such as modal energy localization (MEL, see project 1), and the application of the receptance method to the dynamics of aircraft fasteners. The localization of vibration energy has significant effects on the performance of aircraft structure-fastener systems.

Two hundred billion fasteners are produced annually in the United States. If we assume a conservative retail value of 50 cents per fastener, the potential market value for new fastener technology is in the range of \$100 billion. First, the commercial applications of such development can be directed to aircraft industries. Second, the developed fastener technologies can also be applied to civil structures such as buildings and bridges, commercial products such as engines, various types of vehicles (trucks, automobiles, submarines, ships, and spacecraft).

QRDC officials are interested to discuss any form of collaboration (joint venture, partnerships, strategic alliances, etc.) with large or small companies, SBIR companies, and individuals. We have had collaboration with universities, large companies, and other SBIR companies for the last few years.

**Resource Recycling Systems, Inc.**  
Consultants in Waste Reduction, Recycling and Composting  
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Contact: James A. Frey, CEO

Technology Category: Environment

*An RRS Recycling Technology Update*

Color sorting of glass fragments can be accomplished with the glass fragment color sorting system under development by Resource Recycling Systems, Inc. (RRS). The patent pending ColorSort System will be able to receive a contaminated mixed-colored stream of glass fragments as small as 1/2" and positively sort that stream into three different colored contaminant free streams of glass fragments (clear, amber and gragencies in material recovery facility

design/construction and equipment prototyping, recycling market development, compost system development, pollution prevention and solid waste management system development.

RRS has developed and refined the microelectronics that are part of the high speed optical scanning required to color sort glass fragments. The core sorting unit consists of an optical scanning device, a microprocessor to interpret scanned inputs and direct appropriate actions by the deflector airjets, and the air jets timed to direct each color sorted fragment into its receiving hopper. Flexibility and modularity are key features of the core ColorSort technology. Each ColorSort optical scanning and airjet deflection module can handle all three color sorting tasks. Parallel modules can be installed in a ColorSort System to with projected throughput capacity ranging from 1,000 pounds per hour (two module system) to 1 ton/hour (four module system) and no identified technical upper limits with additional modules.

A typical ColorSort equipped system will consist of a pre-cleaning/sizing unit, surge hoppers and feed conveyors followed by the sorting unit made up of two or more ColorSort modules with sorted glass output then conveyed to final storage locations. While the optical sorting technology is capable of up to 400 color sorting decisions per second (including up to 4 optical reads per fragment), the balance of the mechanical sorting process for each ColorSort module is constrained at performance ratings of 25 to 100 color glass fragment sorts per second.

RRS is actively seeking public and private sector partnerships in developing applications for the core ColorSort technology. Contact RRS by phone, fax or e-mail for more information.

Reveo, Inc.  
8 Skyline Drive  
Hawthorne, NY 10532  
Tel 914-345-9555  
Fax 914-345-9558

Contact Person: Edwin J. Hill, Vice President, Advanced Programs

Technology Category: Communication/Information

*Company Goals:*

Reveo, Inc. is a technology holding company that researches and develops leading edge products utilizing many different technologies. After the core technology is developed and commercial products are proven, a subsidiary is formed to fully focus on commercialization of this technology.

*Project Description*

Reveo has two Phase II SBIR's that are presently being funded. The goal of the first Phase II is to develop a novel micropolarizing technology to be used to

produce 3-D stereoscopic imaging products. For example, the World's first stereoscopic 3-D projection panel has been demonstrated and commercialized using this novel micropolarizing technology. In addition, a stereoscopic 3-D notebook computer is under development as well as a 3-D camera and a 3-D hardcopy process. The patented micropolarizer allows a low cost, high quality, general purpose 3-D stereoscopic imaging technology that can be used to significantly enhance visual displays in many industries including medical, entertainment, education, advertising, architecture, robotics, communications, and presentations to name a few. Additional resources are required to realize the full commercial potential of this novel technology.

The goal of a second Phase II awarded to Reveo is to develop a new mass storage technology that has the potential to offer compact, Terabyte storage capacity with data rates exceeding 1 Giga-bit/sec. This patented concept uses a media that has a narrow band selective/reflective transmission property that permits many layers to be stacked on top of each other. Each layer can be independently addressed for reading and writing. Additional development work is required to demonstrate a 10 layer system in the Write-Once Read-Many (WORM) mode. As this technology matures, a fully configured system will have write-erase capability.

*Other Corporate Capabilities:*

Reveo has several other concepts under development including a novel zinc-air battery system that offers a potential energy density of 500 Whr/Kg. This new battery concept would enable an Electric Vehicle to have a range of 500 miles with a 15 minute recharge time. Other developments are a compact optical crossbar switch, a color filtering technology that offers a 10 fold increase in light efficiency, and finally a new electro-optic beam steering technology that is ultra-compact and provides a switching time of a microsecond.

*Implementation Strategy:*

Reveo is seeking potential joint ventures, partnerships, and strategic alliances in order to fully commercialize the exciting technology developments presently being pursued.

**Rockford Technology Associates, Inc.**

Professional Arts Building  
501 S. Sixth St., Suite 101  
Champaign, IL 61820-5579  
(217) 359-3569 Tel  
(217) 356-2911 Fax  
email:rtainc@aol.com

Contact: Susan DelMedico, Technical Manager

Technology Category: Materials

*Company Description*

Rockford Technology Associates, Inc. (RTA) is a small, responsive R&D company, specializing in high-technology fields related to defense, space, and energy sics research: 1) Thin Film Cold Fusion; 2) Inertial Electrostatic Confinement (IEC) Applications; 3) Dense Plasma Focus (DPF) Operation and Testing. Other plasma work has included research on radiation induced plasmas.

*Project Abstract*

The primary technical objective of this Phase I project entitled Critical Technology Demonstration of a Plasma Focus-Type MPD Thruster was the design, construction, and preliminary testing of a 250-kJ capacitor bank module as the first stage in the development of a 1-MJ Dense Plasma Focus (DPF) Facility. Additional testing with an existing 10-kJ DPF thruster was also initiated to develop additional data for electrode design for the MJ facility. This work considered various gas injection schemes and electrode geometry effects. This report documents the bank design process, construction methods, and preliminary test results for the prototype module as well as the results of the 10-kJ thruster tests.

*Other Recent Work*

- 1 Experimental studies of heat production by electrolysis, using a multilayer thin-film cathode design based on theoretical design
- 2 Inertial Electrostatic Confinement

*Implementation Strategy*

Primarily, this project can demonstrate key technology that is essential for use in future deep space missions for the Air Force and NASA. The thruster technology could provide private companies with a manufacturing opportunity in the future analogous to jet engine production for conventional aircraft. In addition to the thruster work the MJ facility would provide a versatile facility for research on a wide variety of pulsed plasma devices. As a National Users Facility, a number of researchers from universities, private industry and the government with pulsed plasma interests would have the possibility of accessing the facility. In addition, technology demonstrated in this project can impact a wide variety of industrial processes. In the near-term, the MJ facility planned for Phase II offers important ultra-high intensity, pulsed radiation source which should lead to a number of

commercial radiation processing and tomography applications. Other variations on the focus design are of potential use for materials processing and soft X ray lithography. The plasma focus device also past year is for the transmutation of nuclear wastes, such as actinides and plutonium.

**Ross Computational Resources**

318 N. Franklin Avenue

Madison, WI 53705

608-238-4865

e-mail: earthlab@meteor.wisc.edu

Contact: Ruth A. Ross, President  
(ruth@meteor.wisc.edu)

Category: Communication/information

*Company Purpose and Goals*

Ross Computational Resources(RCR) was founded to create a collaboration among scientists, engineers, educators, curriculum developers, software developers, and human/computer interaction specialists in order to build high quality software systems for effective and exciting science education and technical training.

*Project Abstract*

"EarthLab," an interactive learning environment for earth science education, is designed to facilitate an integrated curriculum, cooperative problem solving, and cross-disciplinary application of knowledge and skills. Sample curriculum units will comply with the national science and mathematics curriculum reform standards and model effective use of Internet data resources. An advisory group of educators has helped develop specific objectives for learner behavior and functional requirements for EarthLab software and has contributed many useful suggestions and feedback.

The Phase I pilot project emphasized meteorological case study and real-time weather data demonstrating the educational effectiveness of an interactive visual investigation of aspects of climate that relate to phenomena from all areas of earth science. The enthusiastic response of educators and administrators suggest that EarthLab will be accepted and provide important support for the earth science curriculum and for schools wanting to evaluate the benefits of an integrated science course with creative use of advanced technology. Special attention to cost factors will make EarthLab affordable for schools, libraries and science museums so that it can enrich science education for a wide base of learners.

EarthLab is currently being developed for both the PC(Windows) and Macintosh(System 7) systems. Asymetrix ToolBook and Claris HyperCard have been used as prototyping environments with plans to develop the commercial system in C/C++ on both systems during Phase II. Tentative plans call for a commercial version in C and X-Windows for UNIX workstations to be used mostly

for introductory undergraduate science courses. In addition to the software system, science curriculum units and tutorials will demonstrate and guide effective educational use of EarthLab for each level.

#### *Company Technical Capabilities*

Ross Computational Resources has considerable technical competence in areas of computational science, information systems engineering, educational technology and science curriculum and instruction. Specific areas of strength include databases (relational, object-oriented, spatial), expert systems, hypertext and digital libraries, information infrastructure/network design and management, groupware, data and process visualization, direct-manipulation interfaces, simulation and modeling, tutorials and training software, software for science and engineering education and standards compliance.

#### *Implementation Strategy*

RCR is a small company with big dreams. To fulfill its educational promise, EarthLab needs a rich and robust implementation, high quality training/support, and widespread availability. Appropriate partnerships or alliances could contribute greatly to this enterprise and RCR will explore all avenues with an eye to producing a commercially viable product providing significant benefit to science education.

An effective collaboration has been established between the company's own scientists, software developers, and curriculum designers; university researchers; and elementary, middle, and high school teachers and administrators. Having provided many creative ideas and much useful feedback, these enthusiastic educators and their students are now excited about the prospect of having an interactive learning environment like EarthLab available in their science classrooms and are willing to work with us to make it happen.

A local science center, The Space Place, has been providing their facility for EarthLab Project meetings and teacher workshops and would be willing to house a computer classroom with enough computers (12-20) for hands-on courses in using EarthLab. With assistance such as matching funds from a computer manufacturer or distributor, we may be able to get funding for a computer classroom and/or additional classroom computers for test sites that lack them.

In addition, RCR could use guidance and assistance in developing sound strategies for EarthLab's eventual marketing and distribution as well as in training and support. While RCR has a tentative plan for each of these, our small size and inexperience will probably limit what we can accomplish without alliance with more mature enterprises. RCR would also be interested in partnerships with software vendors whose current products, or a special version of them, could be profitably used and marketed within EarthLab, or to help us derive other products

Sensor Plus Inc.  
4250 Ridge Lea Rd.  
Amherst, NY 14226  
Phone: 716-831-0091  
FAX: 716-831-0212

Contact: Darold Wobschall, VP/Technology

Technology Category: Medical Technology/Instrumentation

*Company Description:*

The primary business of Sensor Plus is the engineering development of electronic sensors and instruments. Because of its relation with the State University of New York at Buffalo, it is able to bring a technical capacity well beyond its size of ten (part-time) engineers. In addition, sensors, signal conditioners, and electronic instruments are designed for specific purposes. Services range from new invention to routine engineering.

*Project Abstract:*

The Digital X-Ray Imager, being developed under Sensor Plus Inc. under a US Army SBIR, will replace the current X-ray film cassettes and will feature portability for field hospitals. X-rays, detected by a scintillation screen are captured by an array of charge coupled devices (CCDs) which are controlled by a high speed control circuitry. The image capturing unit interfaces with a microcomputer system for image manipulation, processing and display. This "front-end-detector" has the dimensions of current x-ray cassettes (3x10 inches; also 14x17 inches possible).

Very high internal image resolution is achieved even with moderate quality optical components and moderate resolution CCDs by combining subsection images from an array of CCDs (1500x2000 pixels for 8x10 inch detector). The spatial resolution of the imager can be increased by expanding the number of photodetector lens pairs or by using higher resolution photodetectors. Moderate size CCD photodetectors are used because of high optical efficiency, high resolution and large dynamic range. With this parallel imaging channel design, the high resolution image is captured in a short time (less than a second). The digital image is displayed on a moderate-to-high resolution liquid crystal display since portability and low power are desired.

The device can be used any branch of radiology, especially where the high dynamic/spatial resolution and concurrent availability of the image are needed. It is especially suited for mammography.

*Other Technical Capabilities:*

Over twelve new sensor technologies have been developed at Sensor Plus. These include capacitance and fiber optic sensors as well as signal conditioners. These sensor technologies are available for license in specific applications or markets.



*Sensor technologies for license are:*

- Patterned Capacitance Displacement
- Segmented Capacitance Liquid Level
- Fiber Optic Displacement/Pressure
- Two-axis LVDT and Microprocessor Conditioner
- Moisture
- Special Purpose Environmental and Medical Monitors

*Proposed Partnership Arrangement:*

Sensor Plus is looking for a corporate partner in two areas:

- (1) **Manufacture of Army Light-Weight X-Ray Imager (SBIR Phase III):** The imager will be produced for US Army field hospitals. Our primary need in this area is for a financial partner. If the size of the contract obtained is large, help in manufacturing would also be required.
- (2) **Manufacture and Sale of Commercial Medical X-Ray Imagers:** To exploit the large potential commercial market for a digital x-ray imager to be used for medical diagnosis, a partner with marketing experience in the medical equipment market and with adequate capital is desired. Further development of the imager is needed to adopt it to specific commercial applications. We believe the best potential application is mammography where the high resolution, contrast enhancement, and digital pattern recognition (tumor scanning) are of special advantage.

**Sentec Corporation**

2000 Oakley Park Road, Suite 205

Walled Lake, MI 48390

Phone: (810) 960-1020

Fax: (810) 960-1814

e-Mail address: [sentec@delphi.com](mailto:sentec@delphi.com)

Contact Person/title: Takeo Sawatari, Ph.D., President

**Technology Category:** Laser/Optics

*Brief statement of company purpose and goals:*

Research and Development/ Engineering of Hi-Tech products in the area of Optical Sensors.

*Project Abstract:*

The current optical sensor for characterization of aerosol has marginal sensitivity and accuracy. A significant improvement in these characteristics has been demonstrated in an advanced prototype level nephelometer during Phase I and II of the project A90-101. The improvements were achieved through enlargement and

reshaping of the optically sensitive volume of the sensor, and increase of both gain and system signal-to noise ratio. Performance of the new design was compared to the current Army nephelometer, demonstrating the magnitude of improvements in all pertinent characteristics required for the detection and analysis of both small particle, and long fiber aerosols.

Completion of research and preparation for commercialization of the inexpensive high performance sensor system is being conducted under the Phase II project. Work is being done on all aspects of the sensor, including network communication of sensor arrays. Potential applications for the product, other than DoD use, include fog detection (airports and highways), air pollution detection (factories, hospitals, and large cities), and special product/process inspections.

*Other corporate technical capabilities:*

- (1) Research and Development of sensors and measurement devices/systems for special problems of Federal Government Agencies such as NIH (currently developing a fiber optic pressure catheter for the NIH), and NASA (currently developing optical micro sensors),
- (2) R/D of inspection techniques for various materials in special environments (developed surface roughness measurement system for automotive/aerospace companies),
- (3) R/D of signal processing techniques for unique Federal Agency problems (developed mine hunting sonar for a US Navy prime contractor), and
- (4) Engineering services for Federal Agency projects.

*Implementation Strategies:*

Two primary options are being considered by Sentec for commercialization and financing. The preferred approach involves the arrangement of a strategic alliances.

Two versions of strategic alliances will be considered. The first and most desirable option for Sentec is the establishment of a strategic alliance with a firm well established in the marketing of technical products in areas involved with the aerosol sensing unit. Under this alliance arrangement, Sentec would focus on the development of the product(s) and establish the capability for manufacturing. The strategic alliance partner would establish links to the market and pursue contingent orders. Manufacturing would proceed accordingly with funding moving from the stage of contingent orders (commercial lending sources of funds based upon the contingent orders), to the stage of revenue based manufacturing/operations.

The second potential form of strategic alliance could be with a manufacturer/market oriented company that is involved with a "composite" product, that is a product which performs multiple functions, including aerosol sensing. Sentec would manufacture and provide the aerosol sensing unit as a sub-part of the total composite unit under contract with the strategic alliance partner.

An alternative approach, licensing of the product, could be used as a necessary alternative to the strategic alliance option, or potentially as an additional means to commercialize on a broad scale.

**Serim Research Corporation**

P.O. Box 4002

Elkhart, IN 46514

Contact:

Robert C. Boguslaski, President

*Company purpose:*

To develop and manufacture simple, rapid analytical test devices for medical applications and on-site commercial uses.

*Abstract:*

Serim Research Corp. manufactures dry reagent strips for semiquantitative measurement of various analytes by medical clinics. The reagent strips are dipped briefly in the test solution, allowed to react for a few seconds or a few minutes and then the color formed on the reagent pads is compared visually to a color chart to estimate the analyte concentration. Current reagent strip products are used to measure the potency of sterilants in disinfectant baths in medical clinics and to test for residual sterilants in hemodialysis solutions.

A product under development detects a bacterium, *Helicobacter pylori*, in biopsy specimens taken from the stomach. This bacterium is an etiologic agent for ulcers and duodenal cancer. The test detects *H. pylori* within 2 hours and can be run at the bedside.

Serim Research Corp. has capabilities to design small instruments for analytical chemistry applications. Present projects are developing instruments for medical purposes.

Serim Research Corp. develops and manufactures simple, rapid test devices for other companies. We manufacture various test devices exclusively for other companies and the devices are sold by those companies for use with their equipment or reagents.

**Sonic Technologies, Inc.**

2935 Byberry Road

Hatboro, PA 19040-2815

Tel (215)-957-2352

Fax (215)-957-2355

Contact:

Mark E. Schafer, Ph.D., President

**Technology Category:** Medical Instrumentation; Process Control

Sonic Technologies' business is ultrasound: sound waves which are above the range of human hearing. Ultrasound has a proven track record in medical imaging, and can be used to non-invasively detect internal structures and characterize materials, on a real-time, continuous basis. Sonic Technologies is an established leader in the measurement, testing, and use of ultrasound, primarily in the medical market. The company's mission for future growth is to take certain ultrasound diagnostic techniques developed for the medical field and apply them to non-medical applications such as food production, materials inspection, and process control.

The company has developed several technologies suitable for further co-development or commercialization. Our primary focus is on a family of microprocessor based ultrasound systems designed to detect and display internal structures in viscoelastic materials and fluids, e.g. foodstuffs, solid dispersions within fluids, etc. We have successfully adapted medical ultrasound design philosophies to create innovative, cost-effective systems suitable for non-medical applications. The product family ranges from a battery-power, portable unit suitable for field inspection of animals, to multi-channel systems designed for integration into a process control hierarchy. This system can be upgraded to provide custom material characterization features as needed. We have also developed proprietary technologies for the accurate measurement of high pressure shock waves, such as those found in underwater explosions. This technology maintains calibration accuracy over repeated exposures, and incorporates a disposable sensor element to reduce costs. Finally, we have developed considerable expertise in the processing of piezoelectric polymer materials for sensor applications, including bonding and selective polarization of thin film materials. These sensors can detect acoustic and vibration signals over a wide range of pressures (to 1000Atm), and frequencies (DC to 50 MHz); sensor element sizes range from 0.2 to 10 square centimeters.

The company's facilities includes a complete ultrasound research, development, and testing laboratory, with test tanks, transducers, pulser/receivers, and computer-controlled data acquisition & sensor positioning equipment. Specialized equipment is available for processing piezopolymer sensor materials. The staff includes experienced senior engineers in electrical, mechanical, biomedical, and acoustical engineering. We have CAD capabilities for both electronic and mechanical design, and a small machine shop and electronics development area for

prototyping work. Finally, we also have a research shock wave generator system capable of focal pressures up to 750Atm.

Our implementation strategy is to exploit our technology and experience through strategic partnerships with companies seeking to 1) apply innovative ultrasound techniques to meet their in-house requirements for process control or product inspection; 2) expand their technology base to enhance an existing product line; or 3) co-develop a new product line using our techniques. As an example, we can conduct pilot applications development research using our in-house facilities, and transfer results to the field or lab facilities of the partner. Sonic would then develop and test the new system through prototype to pre-production; the partner would then be responsible for incorporation into the product line, marketing and sales.

**Spectra Research Inc.**

7071 Corporate Way, Suite 108

Dayton, OH 45459

(513) 436-4454

Fax 436-4993

S\*R Contact: John W. Sellers, Senior Electrical Engineer

Technology Category: Training/Electromagnetics

Spectra Research Incorporated (S\*R), a high technology business based in Dayton, Ohio, provides advanced research and development services for government and industry. The company specializes in high quality, engineering, design, development, and testing of advanced electronic/electromagnetic technology, products and applications. Our expertise includes electromagnetic sensors, software, modeling, simulation, control systems, and applied system designs and development. As a competitive SBIR company, S\*R has successfully captured fifteen Phase I and Phase II SBIR's.

Under contract to the U.S. Army, S\*R successfully developed and demonstrated a non-pyrotechnic audio/visual cueing device. These devices are used in force-on-force Tactical Engagement Simulation (TES) to indicate the presence of explosions, including muzzle blasts and incoming artillery rounds. The A/V cueing device generates flash, bang and smoke cues upon electronic command from the scoring system, warning nearby units that they are under attack. Present A/V cueing devices use pyrotechnics with attendant hazards in storage, handling, and discharge. S\*R's low-cost non-pyrotechnic design offers greater safety, less environmental impact, lower expendable cost and a safe independent control of flash bang and smoke. S\*R's device exceeds the performance of present pyrotechnic A/V cueing devices.

The S\*R technology is applicable to several military training applications such as Main Gun Simulators. Some commercial applications include: intrusion alarms, diversion devices (flash/bang grenades), law enforcement and stage effects. As a

part of S\*R's commercialization initiative, the unit was demonstrated at the October, 1993 Tactical Engagement Simulation Conference hosted by TRADOC at Hampton, Va. The demonstration created great interest in the S\*R approach among both TES equipment suppliers and US Army Combat Training Center personnel. The consensus was such a device should be available for training exercises as soon as possible. S\*R was subsequently awarded a Phase II to develop and prototype a device to meet this requirement.

S\*R has ongoing relationships with subcontractors/consultants from The University of Dayton, The Ohio State University, Wright State University, and The University of Florida. These institutions have aided S\*R by analyzing, designing and conducting studies using the ideas developed by S\*R. S\*R has also teamed up with Georgia Tech Research Institute (GTRI) to develop advanced electromagnetic test devices.

**Srico, Inc.**

664 Petworth Court

Powell, OH 43065

Tel: (614) 846-3239

Fax: (614) 846-3814

Contact person: Dr. Sri Sriram, President

Technology Category: Fiber Optic Sensors

*Brief Statement Of Company Purpose And Goals*

SRICO, which specializes in fiber and integrated optics technology, was founded in 1990 by Dr. S. Sriram and was incorporated in the State of Ohio in February 1992. SRICO is located in Powell, Ohio.

The main thrust of SRICO's research and development effort has been in sensor technology. SRICO has successfully participated in several SBIR contracts from the Department of Defense. One SBIR program is nearing Phase II completion, and commercialization efforts are already underway.

SRICO is currently engaged in the development and commercialization of fiber and integrated optic sensor components and systems. Of special interest to SRICO are voltage, current and electric field sensors. SRICO is under contract to develop electric field sensors for the U.S. Army Harry Diamond Laboratories and the U.S. Air Force Phillips Laboratories. These sensors use the technology of integrated optics for electric field sensing. SRICO is also under contract to develop a voltage sensor for NASA Lewis Research Center.

*Brief Statement Of Project Abstract*

SRICO has developed a novel all-optical electric field sensing device using the technology of fiber and integrated optics. One unique advantage of this sensing device is that it eliminates the use of a metallic antenna or electrical connections

which can interfere with accurate measurement and characterization of the electromagnetic environments.

The sensor is packaged with optical fibers for input and output. The optical fibers enable measurement of the electric field from a remote distance of greater than 100 meters. The remote measurement capability assures personnel safety when high field strengths are to be measured. This sensor has greater bandwidth than existing electric field sensors. In principle, the sensor could be designed to operate at frequencies from DC to as high as several hundred gigahertz. The integrated optic sensor is a passive device that does not require any power supply to the sensor head.

Because it is a photonic sensor, it is immune to electromagnetic interference and allows for precise and reliable measurement of electric fields. The dielectric nature of this sensor permits measurement of fields in hazardous and explosive environments. Photonic sensors overcome the limitations of currently available sensors. The photonic electric field sensor is a key element in emerging applications in smart-skins of aircraft and for sensing electromagnetic events such as radar scans. Several other applications for this sensor include lightning detection on aircraft, non contact sensing of voltages in testing high speed integrated circuits, optical interconnects and measurements of electromagnetic compatibility (EMC).

This electric field sensor is the subject of a United States Patent 5,267,336, issued to SRICO on November 30, 1993. The title of the patent is Electro-Optical Sensor for Detecting Electric Fields. The inventors are S. Sriram, S.A. Kingsley and Joseph T. Boyd.

#### *Other Corporate Capabilities*

Fiber Optics, Optoelectronics, Integrated Optics and Photonic Sensors.

#### *Implementation Strategy*

The sensors developed by SRICO have many different applications. SRICO would be willing to discuss commercialization of its products in one of the potential application areas. SRICO is willing to negotiate a business arrangement suitable to both parties.

#### **Strainoptic Technologies, Inc.**

108 W. Montgomery Avenue

North Wales, PA 19454

(215) 661-0100 (Tel)

(215) 699-7028 (Fax)

Contact:

Alex Redner, President

#### *Company Goals:*

Strainoptic Technologies Inc. specializes in manufacturing and developing new STRESS MEASURING instrumentation suitable for application in

EXPERIMENTAL STRESS ANALYSIS and in QUALITY CONTROL of manufactured products.

*Strainoptic products include:*

Polarimeters for inspection of plastic and glass products; ON LINE process control sensor for monitoring residual stress and orientation; PC-based reflection and transmission polariscopes for experimental stress analysis; MOIRÉ fringe instrumentation.

Strainoptic research efforts are concentrated in our areas of expertise. R&D contracts with SBIR (listed below) and Industry have permitted continuous expansion of our product lines.

**SBIR Projects Abstracts:**

*Readout of Birefringent Sensors:*

*Phase I Completed 1986; Phase II Completed 1988; Phase III Completed 1989*

Description: Commercial system was developed and is now a part of our product line. System sales are increasing yearly with every year exceeding the previous year. Major users include: PPG, Mobil Oil, Schott Glass, ICI, Rubbermaid, etc...

*Fiber Optic Sensor for Measuring High Temperature Gas Pressure:*

*Phase I Completed 1987; Phase II Completed 1989;*

Description: System developed for NASA. Commercial market was insufficient to warrant phase III research.

*Ultrasonic Stress-Measuring Probes:*

*Phase I Completed 1991; Phase II Est. Completion: 1994; Phase III To begin: Nov. 1994.*

*System for Dynamic Stress Analysis of Tires:*

*Phase I Completed 1993; Phase II Award Pending*

*Other Capabilities:*

Strainoptic is prepared to undertake new R&D projects related to our principal goals and compatible with our areas of expertise.

*Implementation Strategy:*

Strainoptic markets products in the US directly (in some areas) as well as through an organization of representatives abroad. Strainoptic exports through exclusive distributors throughout the world. In addition to extensive advertising, our marketing efforts include:

Editorial articles in: Experimental Mechanics; Glass Technology; Glass Digest; Glass Europe. Papers in technical journals including over 25 publications in last 10 years. Activities in ASTM, to develop standards. Lectures. Technical Seminars



Potential joint-ventures with industry include joint R&D marketing agreements (LOF, PPG) and financing of R&D in universities.

**Tachyon Data Systems**

Subsidiary of Solid State Technologies Inc.

7891 Wiggins Rd.

Howell Mi. 48843

Tel (517) -548-3115

Fax (517) -548-2858

Contact:

Tom Wilmoth, President and Principal Investigator

Joe Heslip, Engineering Manager

Tachyon Data Systems is a spinoff company started by SST to capitalize on the development of Infrared data communications research carried out by SST. Phase I awardees under TRP 93-021 DOD category "fly by light".

Tachyon Data Systems develops high speed optical data communications products for the 2 way transfer of computer data without wires. The wireless data communications market is a rapidly growing sector of the electronics industry. Tachyon has demonstrated the concept of an on board optical data communications node to the Auto industry for the purpose of both production line vehicle diagnostics and aftermarket vehicle maintenance.

Other applications include optical LAN environments for the office or factory floor. We are researching 25 Megabit bandwidths for Ethernet type applications. Current products support portable RS-232 links to 115 Kbits per second. Tachyon is a member of the Infrared Data Association. (IRDA)

**Technical Directions**

1210 Oakbrook Dr.

Ortonville, MI 48462

Tel (810) 625-2990

Fax (810) 625-2998

Contact:

Vern E. Brooks, President

**Technology Category:** Miniature Gas Turbine Engines & Accessories

**Corporate Objectives:**

Technical Directions Inc. (TDI) has the overall objective of creating a series of low cost very small gas turbine engines which can be utilized in military and commercial applications where cost has traditionally been a significant barrier. TDI will build a unique capability by combining automotive and defense design techniques into a technology base which will provide the foundation for a family of miniature gas turbine engine related product opportunities.

### *Corporate Summary*

Through the expertise of its associates, a series of internal programs, and seven Department of Defense contracts, TDI has developed a capability to design and develop very small gas turbine engines which depart from the traditional high cost design methods utilized by the gas turbine industry today. Two SBIR Phase I and two Phase II programs and a DARPA sponsored program, all monitored through the US Army Middle Command (MICOM), have created the following gas turbine engine related products which are now being developed:

- Four-Inch Diameter Turbojet Engine (40 lbs. thrust)
- Starter-Generator Systems for the Four-Inch Turbojet Engine
- Seven-Inch Diameter Turbojet Engine (100 lbs. thrust)

These products were designed with the TDI low cost philosophy which was combined with "concurrent engineering" techniques to optimize the engine design for the selected manufacturing methods. These turbojet engine related products are focused at expendable engine applications of tactical missiles, targets, drones, and self-propelled munitions where low cost is of primary importance.

The four-inch and seven-inch engines were designed using production turbocharger rotation components to minimize manufacturing cost. These engines will operate on almost any liquid fuel, and the fuel is used to cool and lubricate the bearings so that no lubricating oil is required for engine operation.

The starter-generator system has been designed to operate with the four-inch engine creating a propulsion module which also includes the generator control and the fuel control. The starter will accelerate the engine shaft to idle condition (60,000 RPM) in 3-seconds, and the generator and generator control will provide 1-kilowatt of electrical power at 28 VDC. This propulsion module has sufficient stiffness to be used as a structural member of an aircraft.

Programs are now being outlined to extend the TDI technologies of low cost high speed rotation equipment into new commercial and defense applications such as portable auxiliary power units smoke generators, hybrid electric vehicle range extenders, model airplane propulsion, and gas turbine engine accessories. TDI is also searching for new technologies in exhaust engine heat recovery and the low cost fabrication technologies for high temperature materials. Supplier and customer working relationships are being sought which compliment the TDI capabilities and technologies and bring systems experience to the team.

**The Technology Partnership**

8030 Coventry,

Grosse Ile, MI 48138

Tel (313) 675-8295

Fax (313) 671-6457

Telex: 493 0989/TECHNOLOGY,

Contact:

David Bettinger, P.E., Project Manager,  
Advanced Materials

*Company Description*

The Technology Partnership is made up of senior scientists and research engineers. The firm researches and develops emerging technologies for commercial and agency clients. Their consulting practice includes many large firms including GM and DOW. The group has experience in technology assessment, market research, and strategic venture planning for clients. The continuing objective is to achieve the highest level of utility possible for each resource that is investigated.

The group has developed its own portfolio of patent art. The immediate goal is to develop time-dependent "smart" polymers for medical implants. These age-shrink plastics can be formulated to continuously dispense viscous fluids from one month to ten years. These bio-compatible polymers are of increasing commercial value because more than half of the \$40 billion prescription drug market is consumed by patients on extended regimens. All of this \$24 billion of oral drugs is vulnerable to conversion to more convenient implants where prescription compliance is assured.

*High-Reliability Long-Term Lubricators based on viscoelastic polymers*

The NASA SBIR is to develop plastic materials for time-dependent self-activated lubricant pumps. Time-dependent shrink plastics are polymers that have an internal energy level due to thermo-mechanical working that manifests itself by a substantial dimensional change with time. Depending upon the polymer chosen and its processing history a variety of durations are possible from a few days to over ten years. The first family of time-dependent polymers has been identified, demonstrated, and quantified. Others are being investigated.

These age-shrink plastics can be used as miniature actuators, micro-deployment devices, wear compensators, and continuous dispensers/lubricators. All of these applications have relevance to micro-robotics, smaller satellites, and longer missions. Current actuator designs are difficult to downsize. Devices made from these smart materials have no moving parts. Because these devices require no lubrication they avoid the principal cause of satellite failure.

By the year 2000 there will still be 40 million vehicles on the road that require suspension lubrication. A two year shrink lubricator has a potential of \$100 million annually.

*Technical capabilities of The Technology Partnership include*

Chemicals/plastics/composites, drug delivery devices, instrumentation, optics, security for large computer nets, advanced computer algorithms, computer modeling, market research, cost engineering, and commercial development.

*Implementation Strategy*

THE TECHNOLOGY PARTNERSHIP seeks joint ventures/strategic partnerships with PHARMACEUTICAL FIRMS with extended regimen drugs about to go generic that can retain control by repackaging as implants, (psychotropics, cardiovascular, digestive, hormones, etc.); POLYMER COMPOSITE MANUFACTURERS for developing new manufacturing techniques for our patented "Smart Dynamic Polymer Composites;" PORTABLE/WIRELESS COMPUTER FIRMS for developing fourth generation personal data assistants based on our unobtrusive glasses-mounted-display; AEROSPACE FIRMS for developing loss-of-consciousness/G-LOC remedies for pilots and truck drivers; INSTRUMENTATION FIRMS for developing a head-mounted-display of heart function for physical conditioning and cardio-risk monitoring; DEFENSE CONTRACTORS to partner on our low-signature composite connectors for ship masts, aircraft booms, radar structures, off-shore platforms, and space frames; AIRFRAME MANUFACTURERS to partner on our hands-free menu-driven glasses-mounted-display for maintenance technicians; SPACE MEDICINE FIRMS to partner on our on-demand transdermal patch for shock/trauma and our composite bone reinforcement system.

**Thermacore, Inc.**  
780 Eden Road  
Lancaster, PA 17601

Contact Person: Mr. Donald Ernst/ V.P. Marketing

Technology Category: Heat Transfer, Heat Pipes, Energy Conversion

*Company Purpose and Goals:*

Thermacore specializes in the development of thermal management components and systems, energy conversion, related materials development and thermal products for electronics cooling. The company goal is to move these technologies into the high volume commercial market. The particular products available to meet this goal include the following:

**Transportation:** A prototype system to both heat and cool cushioned seats has been developed. Investment is being sought to transition the design to production levels suitable to supply the upper-end car market. Other markets include planes, trains and bus seats.

**Electronics/Laser/Optics Components:** Thermal management problems accompany advanced electronics devices as they move from development to application. Power dissipation levels and heat flux densities for these devices are

greater than what can be handled by current electronics cooling techniques. Thermacore has developed a family of advanced thermal products that will keep pace with the ever increasing heat dissipation requirements of advanced electronics. The particular products include SEM-E and B cold plates, high heat flux (100 W/cm<sup>2</sup>) cold plates, chip coolers, flexible heat pipe cold plates, laser diode coolers, cryogenic cooler and porous metal heat exchangers.

**Materials Technologies:** The following materials related products are available for transition into the commercial market: lightweight vacuum tight aluminum lined composite tubing, ceramic-to-metal bonding technology and a unique crystal growth furnace.

**Medical/Biological:** Thermacore is working to develop a freezer for microbiological samples. The freezer combines a stirling cryocooler and heat pipe technology.

*Corporate Technical Capabilities:*

Thermacore has recently moved into a new 30,000 sq. ft. building complete with development laboratories and production facilities. The development area has an experienced engineering staff to address heat transfer relating to both terrestrial and space based systems. In addition, development fabrication facilities at Thermacore provide the engineers with a skilled staff of technicians and equipment so that prototype and first-of-a-kind devices can be readily made. The production facility is setup to deliver several heat transfer products lines in quantities of a few units to several thousand per year. Thermacore's quality system meets MIL-STD-45208A and MIL-STD-45662.

*Implementation Strategies:*

Strategic alliances are sought to help more fully penetrate the electronics cooling market. In addition, investment is being sought to transition the seat cooler design to production levels suitable to supply the upper-end car market.

**Thermal Wave Imaging, Inc.**

18899 W. 12 Mile Rd.

Lathrup Village, MI 48076

Phone: (810) 356-7241

Fax: (810) 827-1444

Contact: Steven M. Shepard, Ph.D., President

Technology Category: Materials

*Company Purpose and Goals:*

Thermal Wave Imaging, Inc. was founded in 1992 to develop and commercialize products and services for nondestructive testing of materials. Company activities include: 1) Product sales. 2) In-house and onsite nondestructive test services. 3) Government and privately funded R&D. 4) Consulting and application engineering.

***Project Abstract:***

The project "Nondestructive Inspection of Aging Aircraft" was funded by a grant from the Michigan State Research Fund. The research has been focused on developing a dedicated thermal wave imaging system for detection of corrosion and delamination under lap seams in aging aircraft. A prototype system, capable of identifying these and other defects in a wide variety of materials, including metals, composites, plastics, and even concrete, will be demonstrated. Principal advantages of this system include the ability to perform contactless inspection of wide areas (~ 2 sq. ft.) quickly (< 1 min).

***Capabilities:***

We have demonstrated a strong applied R&D capability in working with several leading aerospace companies, and have also shown the ability to transition a product from the concept stage to the market, as we have done with the original EchoTherm PC based thermal wave imaging system. In addition to expanding our R&D activities in this field, we plan to target specific markets (e.g. automotive, infrastructure, castings, composites) where additional research is required in order to make thermal wave techniques feasible for widespread use.

***Implementation Strategy:***

We are seeking strategic alliances in the form of technology, marketing, and investment

**TIP Engineering Group, Inc.**  
27620 Farmington Road, Ste. B-6  
Farmington Hills, MI 48334  
Tel 810-489-5522  
Fax 810-489-5526

***Company Goals and Purpose***

TIP was incorporated in March, 1985 as an independent service company whose principal business is the development of specialized technology for interior trim automotive products that are affected by government safety legislation such as FMVSS208 (airbags). TIP's revenues are incurred through design and engineering programs, royalties from technology and patent licenses, part profits through joint venture manufacturing and commissions from special material development and sales.

Commercial application of a high energy device is targeted to all interior trim products that cover a government legislated airbag. Initial technology will satisfy passenger airbag instrument panels with transfer to driver airbag covers, side door trim panels and rear airbag front seat backs for two major USA automotive companies.

#### *Statement of Project Abstract*

Three types of high energy devices were evaluated; namely, Enclosed Pyrotechnic Energy, Chemical Pyrotechnic Printing and Pyrofuse Heat Energy in order to initiate a cut out of a totally invisible passenger airbag door in an instrument panel. Development testing consisted of a component bench test of sample plaques of PVC skin material. The criteria for feasibility was for the High Energy Device to cut completely through the material in less than 1 millisecond without any significant particulates. From the results of the development tests on each concept, it was determined that Chemical Pyrotechnic Printing was feasible for continued development in Phase II. If approved, Phase II should consist of an 18 month R&D program between February, 1994 and August, 1995 resulting in feasibility of an energy device product and a specification that satisfies all OEM's and first tier manufacturer requirements.

#### *Other Corporate Technical Capabilities*

Focusing around interior trim safety, TIP has worked towards the "total system" environment taking into consideration not only the airbag deployment doors but the design and development of knee bolster systems integrated into instrument panel structure, the identification and refinement of one of the most inexpensive and efficient flexomer materials for safety and interior applications through Union Carbide, along with research and development in various composite materials for energy absorption capabilities relative to occupant protection.

#### *Implementation Strategy*

Currently, TIP owns 7 worldwide patents, 8 patent filings and 32 disclosures that cumulatively possess 50% of the current deployment door technology market, 100% of the next mechanical invisible seam technology level and 100% of the future market for the improved High Energy Device Invisible Seam technology level. Prior to completion of the Phase II NSF Program, TIP plans to have license agreements with Chrysler, UTA and Morton as well as a manufacturing joint venture with Talley Defense. This primary plan will propagate to all other worldwide OEM's, instrument panel and airbag manufacturers either through the marketing clause within the host manufacturing license agreement or directly through TIP's marketing strategy.

**TJ Technologies**  
17445 Cameron  
Northville, MI 48167  
Tel (810) 347-0305  
Contact:

Maria A. Thompson, President

Technology Category: Materials

*Company Purpose and Goals*

Our mission is to develop and commercialize advanced materials for private industry and the government. In addition, we provide materials characterization services using state-of-the-art analytical techniques.

*Brief Description of Company's Business Operations*

We specialize in the design, synthesis and characterization of ultrahard, electronic and catalytic materials. We have successfully completed Phase I SBIR Contracts for the Department of Defense. Phase II proposals are currently being evaluated.

Our business office is in Northville and we lease laboratory space in Ann Arbor. We also utilize facilities at the University of Michigan.

*Project Title: Ultracapacitors Based on High Surface Area Nitride/Carbide Electrodes*

Brief Statement of Project Abstract: There is an increasing need for efficient, lightweight power sources for a variety of commercial and military applications. Capacitors and batteries are the primary components employed for electrical energy storage. Recent advances in capacitor design and manufacturing have resulted in substantial increases in capacitive energy storage density. Combined with similar gains in greater temperature stability, reduced leakage current and improved manufacturing reproducibility, high energy density capacitors are finding many new applications. In particular, capacitors are displacing batteries where weight, power density, recharge cycle limitations or toxins use reduction are factors in selecting an energy storage device.

We recently developed a new class of electrodes based on high surface nitrides and carbides for use in ultracapacitors. Ultracapacitors attain high capacitances and energy densities by double layer charge storage at conductive high surface area electrodes. Test capacitors assembled from these new electrode materials demonstrated electrical performance comparable to existing capacitors based on high surface area, dimensionally stable ruthenium oxide and carbon electrodes.

Applications for ultracapacitors based on high surface area nitrides and carbides are expected to include computer memory back-up, space power, electric vehicle load leveling and other energy storage applications being fulfilled by batteries. High surface area nitride and carbide electrodes might also be used in fuel cells and other electrochemical devices.



*Implementation Strategy - Ultracapacitors Based on High Surface Area Nitride/Carbide Electrodes*

Currently our strengths are in the areas of materials processing and characterization. Our commercialization strategy will be to patent and license the materials and/or processes to other companies with appropriate experience in fabricating, packaging and marketing ultracapacitors and batteries. We will retain a role in designing and piloting equipment for the key electrode fabrication steps.

*Project Title: Self Propagating High Temperature Synthesis and Dynamic Compaction of Titanium Carbide and Titanium Diboride*

**Brief Statement of Project Abstract:** Titanium diboride and titanium carbide are attractive for a variety of applications including automobile engine parts, cutting tools, wear-resistant parts, light-weight armor and thermal protection systems because of their high melting points and strength, good thermal shock resistance, excellent high-temperature stabilities, and light weights. The fabrication of  $TiB_2$  and  $TiC$  by conventional sintering, hot-pressing or hot-isostatic pressing techniques is costly because of the time- and facility-intensive nature of these processes. The application of  $TiB_2$  and  $TiC$  ceramics has thus been limited. Self-propagating, high-temperature synthesis (SHS), however, provides an effective method for producing  $TiB_2$  and  $TiC$ . The SHS process takes advantage of the extreme heat generated during the formation of some refractory materials. When a compact of the constituent elements is ignited, the highly exothermic reaction propagates spontaneously, and converts the reactants into a refractory product. When combined with a dynamic compaction (DC) step this technique provides a route to dense, refractory materials including borides, carbides, nitrides and silicides.

During our Phase I SBIR we fabricated near fully dense, monolithic  $TiC$  and  $TiB_2$  compacts from the elemental powders. The compacts had densities greater than 97 and 99% of the theoretical densities of  $TiC$  and  $TiB_2$  respectively. The microhardness, compressive strength and elastic moduli of these SHS/DC fabricated materials were comparable to those of the hot-pressed ceramics. Preliminary cost estimates indicate that a potential drawback in the SHS/DC of  $TiB_2$  is the high cost of boron powder. We recently demonstrated the fabrication of high quality,  $TiB_2/TiC$  composites from a series of inexpensive precursors. Typically, the densities of these composites were greater than 98% of the theoretical value and the microhardness was comparable to those of monolithic  $TiB_2$  and  $TiC$ . Further development of this technology could lead to an economical, high efficiency process for the fabrication of refractory ceramics including  $TiC$  and  $TiB_2$ .

*Implementation Strategy - Self Propagating High Temperature Synthesis and Dynamic Compaction of Titanium Carbide and Titanium Diboride*

Currently our strengths are in the areas of materials processing and characterization. Our commercialization strategy will be to patent and license the materials and/or processes to other companies with appropriate experience in fabricating and marketing ceramic materials.

*Other Corporate Technical Capabilities*

**Advanced Materials Synthesis:** Ceramic and polymeric coatings; ultrahard materials; catalysis; and high surface area electrodes.

**Materials Characterization:** Mechanical properties; surface & bulk morphology; electrochemistry; and surface area & pore size distribution.

**Using Techniques Including:** Chemical and physical vapor deposition; ion beam assisted deposition; shock wave processing; and high temperature solid state synthesis.

**Using Techniques Including:** X-ray diffraction; electron microscopies; infrared and raman spectroscopies; and voltammetry.

**Consulting Services:** Materials characterization; application of advanced ceramic/electronic/catalytic materials; and environmental impact of materials synthesis.

**TLC Precision Wafer Technology, Inc.**

661 5th Avenue North, Suite 160

Minneapolis, Minnesota 55405

Tel (612) 341-2795

Fax (612) 341-2799

E-Mail (will be sent to you)

**Contact Person:** Timothy T. Childs, Ph.D., President

**Technology Category:** Advance Semiconductor Wafer Manufacturing Company (Gallium Arsenide and Indium Phosphide) for microwave, millimeter wave and optical (photonics) integrated circuits and systems.

*PURPOSE and GOALS:*

TLC Precision Wafer Technology, Inc. is a semiconductor manufacturing company that specializes in advance gallium arsenide (GaAs) epitaxial wafer technologies. TLC is a fully independent spin-off of Honeywell Corporation. In the early 1980's Honeywell initiated a molecular beam epitaxy (MBE) group to provide captive gallium arsenide capabilities for the corporation's advanced systems research and development efforts. Despite the small scale of their operation, this group is responsible for many world's leading GaAs devices and processing technologies.

TLC Precision Wafer Technology, Inc. started in 1991 and represents over 10 years of experience in III-V materials (GaAs and InP). TLC was established with a technology and equipment effusion from Honeywell's Microelectronics Laboratories. TLC successfully converted Honeywell's advanced research and development capabilities into a viable commercial manufacturing operation.

The operation is located in Minneapolis, Minnesota, a town with an excellent climate for advanced technology development and MBE operations. The area

provides outstanding equipment support as well as solid support for expanding business development.

TLC, an extremely focused company ( 8(a) Certified), is structured to reduce the price of gallium arsenide and indium phosphide epi wafers to a level compatible with profitable commercial production. TLC takes pride in providing competitive prices, without any compromise in quality or performance. TLC provides superior products at competitive prices to give customers a competitive advantage.

#### *CORPORATE DIRECTION*

TLC is presently producing advanced 3-inch MBE wafers and scheduled 4-inch capabilities in mid-1994 and a 6-inch production system in 1995. A complete Research and Development laboratory will keep TLC on the forefront of the industry. This leading edge technology coupled with an aggressive pricing philosophy will allow TLC to further contribute to our customers competitiveness.

#### *SBIR PROJECT ABSTRACT:*

a. NASA SBIR PROJECT: Develop and manufacture low noise latticed engineered JFETs for cryogenic circuit applications; i.e., for high performance detector and circuits for satellite communication

b. DOD (ARPA) SBIR PROJECT: Low cost advance material for Millimeter Wave Transistors for 94 GHz (W-Band) Communication

c. DOD (Air Force): Optical Detector for Optical Communications at 1300 um to 1500 um

#### *Other corporate technical capabilities:*

- Manufacture advance GaAs base epitaxial wafers,
- Advance MMIC circuit design, test,
- Wafer/circuit sawing and packaging,
- Advanced material and device research and development

#### *JOINT VENTURES:*

Martin Marietta/TLC Mentor-Protege contract, Honeywell/TLC ARPA and Air Force contract, University of MN/TLC detectors and circuit development.

**TRICOR Systems, Inc.**  
400 River Ridge Drive  
Elgin, IL 60123  
Phone: (708) 742-5542  
Fax: (708) 742-5574  
Contact:

Phillip G. Allen, President

Technology Category: Surveillance/Reconnaissance

TRICOR Systems Inc. has been designing, developing and manufacturing high-quality hardware and software products for military and industrial customers since its inception in 1976. TRICOR's products include a mix of fully-qualified military hardware, company-generated software programs, image-processing systems, reconnaissance and illumination systems, training simulators and varied avionics equipment and electronic test equipment and instrumentation.

TRICOR's goal is to continue to develop and manufacture innovative products for the military and industry. The unique industrial products being developed and currently in production have and will continue to draw heavily on dual-use technologies.

TRICOR and its personnel's long history in reconnaissance systems has led to the Phase II SBIR that has provided the expertise for procuring components and providing the design work necessary to produce a small, low-cost standoff surveillance/reconnaissance system. The system is designed to produce a bar space resolution of three feet at 10 nautical miles while being flown in a helicopter. The system provides the capability to acquire targets with zoom optics and features automatic display tracking. A complete viewing and image-processing station is included as part of the system developed along with video recording capability. The station can be employed on board or stand alone on the ground.

The sensor packaging (camera and gimbal) can be installed in a small volume allowing internal aircraft or pod use. Productionizing and safety-of-flight testing is required before quantity manufacture. The system currently employs an operator actuated joystick for acquisition. This would need to be automated to perform a true reconnaissance function.

The system provides performance that approaches systems that are on the order of magnitude larger in both size and cost. Current cost estimates place the system less than commercially available systems with less performance.

TRICOR has gained an outstanding reputation in the design and manufacture of automatic test equipment for both commercial use and military.

TRICOR's LM-230 Programmable Automatic Test Set was the first fully Mil-qualified, portable all-purpose test equipment every produced. The unit can be

programmed to test and display the performance functions of virtually all digital and analog electronic equipment. TRICOR's Model 501 Automatic Temper Meter has become the world standard for instrumentation to measure the temper of chocolate by the confectionery industry. Other one-of-a-kind instrumentation have been developed and patented by TRICOR Systems. TRICOR's Model 951A Automatic Switch Test Station and its Model 801 Gloss Analysis System have been accepted by industry as standards for the measure of both electronic switches and the gloss of a variety of products.

TRICOR has been a participant in the Low Observables field since its inception. Its software analysis products for the signature reduction field have gained acceptance by the U.S. Air Force, U.S. Navy and by virtually all major airframe manufacturers. The image-processing capabilities possessed by these systems is unique.

TRICOR is interested in partnering with a major corporation to exploit military, foreign and commercial markets on a cost-sharing basis.

**U.S. Automation Company (USACO)**

25542 Green Court

Warren, MI 48089

Tel (810) 755-1127

Fax (810) 755-6248

Contact:

Daniel J. Borodin, President

Technology Category: New Manufacturing Technology

*Company Mission*

To commercialize the Thermastress Miniplant Technology (TMT), by applying it to the manufacture of selected products. TMT is an enabling novel manufacturing technology developed by USACO's R&D efforts over a period of twelve years. Key elements of the TMT R&D effort were carried out through a National Science Foundation Phase I - Phase II program.

*Project Abstract*

TMT is a fully automated continuous manufacturing technology structured around the thermomechanical process call Thermastress. The Thermastress process (TSP) shapes continuous sections of steel to near-net shape, simultaneously altering its microstructure in a way to increase its strength up to four times. This results in a superior product manufactured for substantially less cost. The increased strength makes possible lower material content in a majority of the products. This translates into additional reduction of product cost as well as potentially very valuable reductions in product weight. It was initially developed for the continuous manufacture of wire, however, now it is applicable to a full range of "precursory" (intermediate) products. Its production scale technical

feasibility was established by the Phase II SBIR sponsored by the National Science Foundation.

#### *Other Corporate Technical Capabilities*

USACO has over 30 years of continuous operating experience in finding creative solutions for manufacturing problems. The company provides turn-key automation systems designed to manufacture products. Current activities are focused on development products through the maximum effective utilization of TMT. In addition, USACO is presently in the advanced research stage of a "breakthrough" continuous steel casting process, called "CENTRICAST." This process is capable of producing a high quality small cross-sectional area continuous steel ingot. This process will ultimately be coupled upstream of the TMT production line. The raw material for the CENTRICAST process will be quality scrap steel. The continuous ingot will be produced free of slag inclusions, porosity and segregation. The function of CENTRICAST will be to further reduce the cost of raw material by forty to forty five percent and substantially improve the quality of the raw material entering TMT process.

#### *Implementation Strategy*

USACO's main focus in commercializing TMT is to compress the current "Technology Adoption Time Frame" to fully exploit and maintain its present technological advantage. USACO has current plans to form subsidiaries to manufacture selected common products having large established markets and which can gain maximum competitive advance from TMT. Several initial areas have been identified. These involve product areas ranging from fasteners to construction steel. This will be accomplished by forming a highly profitable initial subsidiary which will create momentum for the formation of subsequent subsidiaries. Venture capital funding is being sought to achieve the initial developments. The current business plan indicates that this will involve high competitive return on investment in the vicinity of ten times (based on an Initial Public Offering in the fifth year and not including the potential benefits of the CENTRICAST technology developments). USACO's strategy provides for participation in joint ventures in certain niche markets. USACO will also consider serious offers for strategic alliances.

**Daniel H. Wagner Associates, Inc.**

2 Eaton Street, Suite 500

Hampton, VA 23669

(804) 727-7700

fax (804) 722-0249

e-mail info@dhwa.com

Contact:

Dr. Joseph H. Discenza, Vice President

**Technology Categories:** Search Software, Data Fusion, Automated Shiploading, Tactical Communications Analysis, Optimization.

Wagner Associates provides Operations Research, Mathematics, and Software Development consulting services for DOD and private industry.

***SBIR Products:***

**SEARCH SOFTWARE:** (1) MELIAN II underwater search planning, direction, and sensor management, presently in Phase II development of a commercial product for use on all types of search and recovery and salvage operations. A highly portable laptop system configuration will support all popular sensors from a wide variety of manufacturers. (2) Search and Surveillance Planning System (SSPS) in several forms, Phase III Coast Guard counternarcotics and search and rescue, pending Phase II Navy anti-surface warfare Tactical Decision Aid (TDA) and Anti-Submarine Warfare planning TDA.

**DATA FUSION Phase II:** (1) Track-to-track correlation for AWACS, completed Phase II, awaiting Air Force decisions about funding additional work and possible in-flight testing, (2) Contact-to-track correlation for multiple source data using multi-hypothesis techniques, completed Phase II, (3) Global Correlation Engine utilizing non-Gaussian tracker for high-interest targets, now in Phase II.

**DATA FUSION completed Phase I, Phase III sponsors needed:** (1) Brownian-heading tracker that accounts more accurately for typical aircraft maneuvers with application to track-before-detect signal processing, (2) Tactics and Intentions Prediction System to perform situation assessment in terms of probable target tactics and intentions, (3) Neural Network Probability Data Association for Radar Tracking in low probability of detection, high clutter environments, using neural network hardware, and (4) Near-Real-Time Data Fusion designed to perform real-time, Multi-hypothesis, non-Gaussian correlation and tracking with minimal delay or slowdown under any conditions.

**AUTOMATED SHIPLOADING Phase II:** Crane Control Automation and Anti-Sway. This research has culminated in a computerized system to retrofit existing container cranes for both automatic and semi-automatic container movements with zero sway. The technology is readily adaptable to all kinds of pendulum-load materials handling system and provides the fastest point-to-point

movement without sway. Completed Phase II, have a commercial Phase III sponsor, and the product is being offered for sale.

**AUTOMATED SHIPLOADING** completed Phase I, Phase III sponsors needed: Pierside Ship Motion Determination. This system uses a combination of video and ultrasound sensors to track the motions caused by loading and tides, in six degrees of freedom, for accurate placement of containers under automatic loading.

**INTEGER PROGRAMMING:** completed Phase I, additional Phase III sponsors desired. Research extended the size of problems that can be handled with commercial linear programming tools, and is developing interactive tools for use by nonspecialists. Phase III sponsors will receive assistance with particular large-scale integer programming problems.

**TACTICAL COMMUNICATIONS ANALYSIS:** Information theory applied to JTIDS circuit loading, pending Phase I award.

*Other Technical Capabilities:*

(1) Patented stick-figure tracking for radar airport surveillance, (2) Patented chassis tracking for automatic loading of containers onto truck chassis in shiploading operations, (3) Capabilities in applying machine vision technology to challenging industrial problems, (4) General simulation, modeling, and analysis, (5) Embedded Ada, C, and Assembly.

*Implementation Strategy:*

Phase III Alliances: we are amenable to a variety of arrangements.

**Wedeven Associates, Inc.**  
5072 West Chester Pike  
Edgmont, PA 19028-0646  
Phone: (610) 356 - 7161, (610) 356 - 7096  
Fax: (610) 325 - 0687  
Contact person: Lavern D. Wedeven, Pres.

**Technology Category:** Materials and Transportation

*Company purpose/goals:*

Purpose - bridging the gap between tribology (science and technology of lubrication and wear) and its application. Goals - (1) provide a unique and comprehensive test capability for R&D and performance prediction of bearing and gear components, (2) develop and apply vapor lubrication schemes which utilized a minute supply of oil, capable of ultra-high temperatures operation, 540 °C (1000 °F).



*Project Abstract(s):*

Vapor Lubrication - A new lubrication technology which utilizes vapors in place of liquid lubricants, but yet maintains the same lubrication mechanisms of liquids for reliable performance. The new vapor lubrication technology provides opportunity for:

1. Extremely small quantities of oil.
2. No pumps, filters, coolers used in conventional lubrication systems.
3. Lubrication over a large temperature range, up to 540 °C (1000 °F).
4. Additive enhancement without need for solubility.

Vapor lubrication of a cruise missile bearing was demonstrated under Air Force SBIR, Phase II (Contract No. F33615-91-C-2161) to 30,000 rpm (0.9 MDn) and 540 °C. Wedeven Assoc. Inc. and Teledyne CAE to be under Air Force PERDA contract in 1994 to apply vapor lubrication technology to two advanced cruise missile engines.

Current technical efforts are in miniaturization of vapor generation and delivery systems. We are looking for commercial spin-offs in the manufacturing and transportation areas. Our company has a comprehensive testing capability to develop specific applications to the component stage.

**Wright Materials Research**

3591 Apple Grove Dr.

P.O. Box 31667

Beavercreek, OH 45430

Tel (513) 429-4108

Fax (513) 429-4101

Dr. Seng C. Tan, President

*Introduction*

Wright Materials Research Co. (WMR) is a small disadvantaged company dedicated to performing basic applied research in the stress and failure analysis, design and characterization, processing, fabrication, and deposition of advanced materials and composites. Major research and development efforts are performed on a contract basis for both government and private industry. The company was founded in January 1990 by Dr. Seng C. Tan, President. WMR was awarded the 8(a) status on 15th June 1993. Currently WMR has 8 engineers. Our personnel have strong capabilities in analytical and computational analysis of materials and structures, fabrication and characterization of materials and structural components, deposition and processing of advanced thin films, NDI/E of metallic and polymeric composites. The technology that we develop will be commercialized ourselves or through a joint venture relationship with any well-established companies.

*SBIR Phase I Project*

In this Phase I research (sponsored by NASA Lewis Research Center) we have developed a combined BEM/FEM approach for dynamic analyses of aeropropulsion system structures. Phase I approach uses a 2-D whereas Phase II

research will use a 3-D elasticity theory. The proposed methodology will capture the advantages of both the FEMs and the BEMs and achieve an optimal combination of efficiency, accuracy and cost. A user friendly computer program with this BEM/FEM and a fatigue criterion will be developed for the probabilistic design of aeropropulsion system structures.

The computational tool developed in this SBIR project can be used to effectively analyze and perform probabilistic design for aeropropulsion composite or metallic structures including engine fan blade and housing for military and commercial aircraft. When the computer program is parallelized, preprocessor and postprocessor as well as graphic presentation of results are developed in Phase II and Phase III of this program, the computer execution time and cost will be reduced tremendously yet the solutions will be obtained accurately and friendly.

#### *Business Opportunity*

We are looking for support and possible joint venture for further development of this SBIR project and other products (graphitic microcellular foams, composite fabrication using RTM, thin film coating, etc.). We are also interested in providing technical service using the softwares developed, such as helping aircraft companies to optimize design their turbine blades, engine housing, structural components, etc. We can also help designers and manufacturers to perform analysis and design for their products.

Yoder Software, Inc.  
3100 Benham Avenue  
Elkhart, IN 46517  
Voice: (219) 288-4864  
Fax: (219) 288-4864  
E-mail: 74670,3412@compuserve.com  
Contact: John-David Yoder, President  
Steve Remis, Robotics Engineer

Technology Category: Other (Automation and Robotics)

Yoder Software Inc. was founded in 1991, with a focus on custom software development. Since that time, the company has grown towards becoming a provider of complete turnkey automation systems, including software and hardware. Our goals are to aid the robotics and automation community with contributions in three important areas: design of manipulators for increased capabilities, improved user interfaces, and robust control strategies.

The NASA (LaRC) SBIR provides a significant opportunity for entering the market of manipulators designed for increased capabilities. The Phase I project will result in a model for a singularity-free, spherical, pointing system designed to have a complete workspace without singular configurations. This SBIR builds on our recent internal improvements in mechanical design capabilities. The company

1  
hired Dr. Steven J. Remis in January 1994. His doctoral dissertation dealt specifically with the design of singularity-free manipulators. Additionally, the company is working with Dr. Michael Stanisic, Associate Professor of Mechanical Engineering at the University of Notre Dame. He specializes in the area of manipulator kinematics and design. We believe the hiring of Dr. Remis and the company's relationship with Dr. Stanisic were instrumental in receiving the Phase I award, and we are uniquely poised to make immediate, significant contributions to this important technology.

In addition to the efforts in manipulator design, John-David Yoder, company president, has been developing software user interfaces for the factory floor since 1986. The focus of these interfaces has been to allow factory workers to take advantage of the power of computers and automation without the need for any specialized training.

Our third area of emphasis is in robust control algorithms. The company has established a working relationship with Dr. Steven Skaar, Associate Professor of Mechanical Engineering at the University of Notre Dame. He has developed and patented a novel approach for controlling manipulators for high-precision three dimensional tasks using vision. The technique, known as camera-space manipulation, has been used in a laboratory to control parts-mating tasks with less than a one millimeter tolerance, without the added cost of jigs, fixtures, or tactile sensors. We are hopeful that Yoder Software, Inc. can be instrumental in bringing this technology to industry. In addition, company president John-David Yoder is in the process of completing a Ph.D. in Mechanical Engineering, specializing in the control of mobile robots.

We feel that the breadth of experience that Yoder Software, Inc. possesses, along with our relationship with the University of Notre Dame, puts us in a unique position to address and solve automation problems facing industry in the United States.

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